February, 1930

Railway Engineering and Maintenance

HY-CROME is made in a plant *that makes only spring washers*

THE Reliance Manufacturing Company, like the railroads, is highly specialized in its plant and its product. Railroads sell transportation; Reliance makes spring washers.

HY-CROME electric alloy steel is made to our own formulae, and the bar steel is drawn in our own mills. Annealing, oil quenching, hardening and polish tumbling is done with the most modern equipment. Every step is under laboratory control, which is why the great reactive pressure and wide reactive range of HY-CROME is a definitely known quality of constant value.

The main line tracks of heaviest traffic capacity are the *railroads'* laboratory where the HY-CROME TRACK TEST earns recognition as the lowest cost per mile insurance of permanent rail joint rigidity.

THE
RELIANCE MANUFACTURING CO.
MASSILLON, OHIO
Engineering Materials, Ltd., McGill Bldg.
Montreal, Quebec, Canada

HY-CROME

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 105 W. Adams St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter January 13, 1916, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.
Alphabetical Index to Advertisers, Page 62 Classified Index to Advertisers, 58-60

THE LUNDIE TIE PLATE INSURES THE UTMOST IN CROSS TIE CONSERVATION

THE unique design of the bottom immediately lifts the Lundie Plate out of the ordinary class of tie plates to the plane of a truly economic device.

Long experience with millions of Lundie Plates in track, proves conclusively that this scientifically designed bottom while holding track to gauge does not cut a single fibre of the tie.

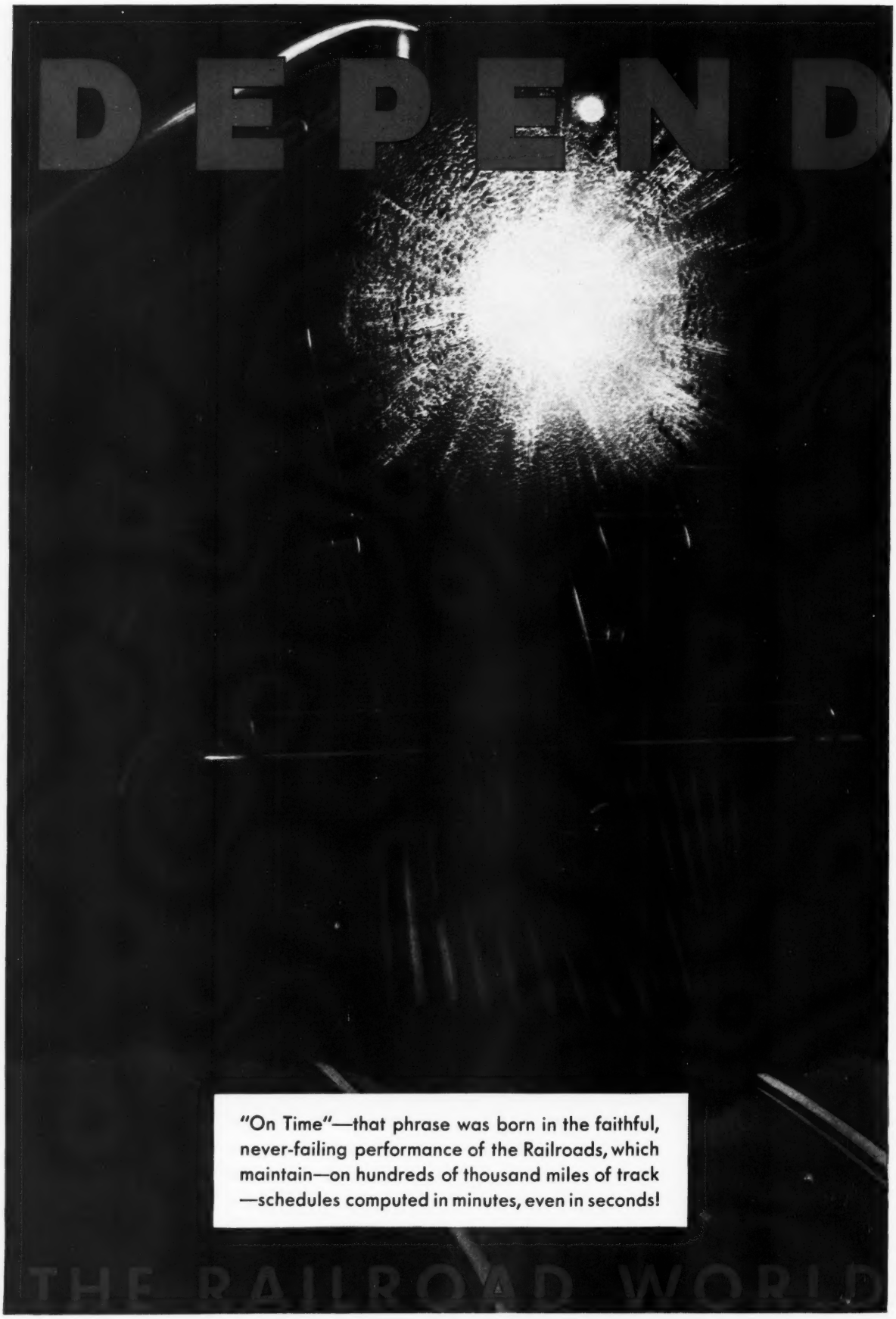
Lundie Plates, by the complete elimination of sharp tie destroying projections, assure 100% service from treated ties.

THE LUNDIE ENGINEERING CORP.

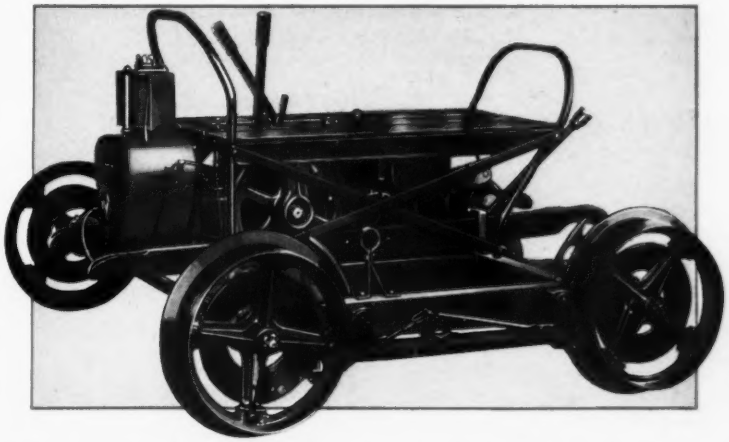
285 Madison Ave., New York

166 West Jackson Blvd., Chicago

LUNDIE TIE PLATE


DEPEND
"On Time"—that phrase was born in the faithful, never-failing performance of the Railroads, which maintain—on hundreds of thousand miles of track —schedules computed in minutes, even in seconds!
THE RAILROAD WORLD

ABILITY



Fairmont MM9 Inspection Car Water Cooled for 1 or 2 men. Other models include: C1—Air Cooled for 1 or 2 men, and M19—Spring Mounted for 1 to 4 men

To protect the reputation for dependability that it enjoys, the Railroad World must be certain of the performance of every factor—human and material—that enters into its service. In no department is this so clearly seen as in maintenance and right of way, where Fairmont equipment is fast becoming the standard.

Dependability, when applied to Fairmont Motor Cars, has a double meaning. It means continuous, never-failing service and also *lowest over-all cost* service. This is not an idle claim, but a matter on record in thousands of railroad offices, and in the fact that *more than half the motor cars now in service are Fairmont products!*

FAIRMONT RAILWAY MOTORS, INC.

FAIRMONT, MINNESOTA, U. S. A.

General Sales Offices: 1356 Railway Exchange Bldg., CHICAGO

District Sales Offices: New York City Washington, D. C. St. Louis San Francisco New Orleans

FAIRMONT RAILWAY MOTORS, Ltd., Toronto, Canada *Foreign Representative:* BALDWIN LOCOMOTIVE WORKS

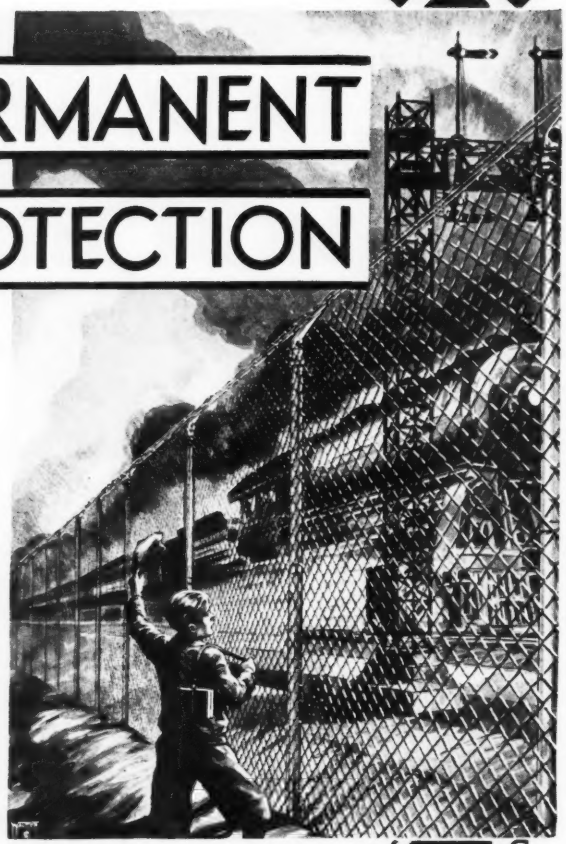
Manufacturers of section motor cars, inspection motor cars, gang and power cars, weed burners, ballast discers, ball and roller bearing engines, push cars and trailers, roller axle bearings, wheels, axles, and safety appliances

Fairmont Mudge

Performance on the Job Counts

KNOWS FAIRMONT

PERMANENT PROTECTION



The cost of maintaining adequate protection along right-of-ways can be substantially reduced by the adoption of Anchor Chain Link Fences. Anchor Fences are designed and constructed to defeat wear, tear and strain. They are built to give permanent protection on a low-cost-per-year basis.

Anchor Square Terminal Posts—U-Bar Line Posts—Square Frame Gates and Drive Anchorage are the four major exclusive features that add materially to the strength and durability of Anchor Fences and reduce maintenance to a negligible amount.

Have the nearest Anchor Office send you information about Anchor Fences and their enduring construction.

ANCHOR POST FENCE COMPANY
Eastern Avenue and Kane Street
BALTIMORE, MD.

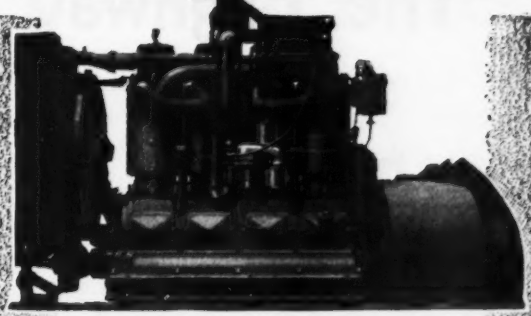
Representatives in all principal cities
Consult local classified directory

ANCHOR FENCES

Makers of
America's First Chain Link Fence.

NORTHWEST oil engine economy

NORTHWEST crawler versatility!



THE Northwest oil engine brings the railroad a new economy in the operation of cranes and shovels—the economy that comes with burning low cost fuel of low distillation range—economy plus the dependability that comes with gasoline.

Combine this power plant with Northwest crawler versatility and you have an unbeatable combination for new construction, maintenance or store yard work.

Let us show you motion pictures of Northwests on railway work.

Northwest Engineering Co.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

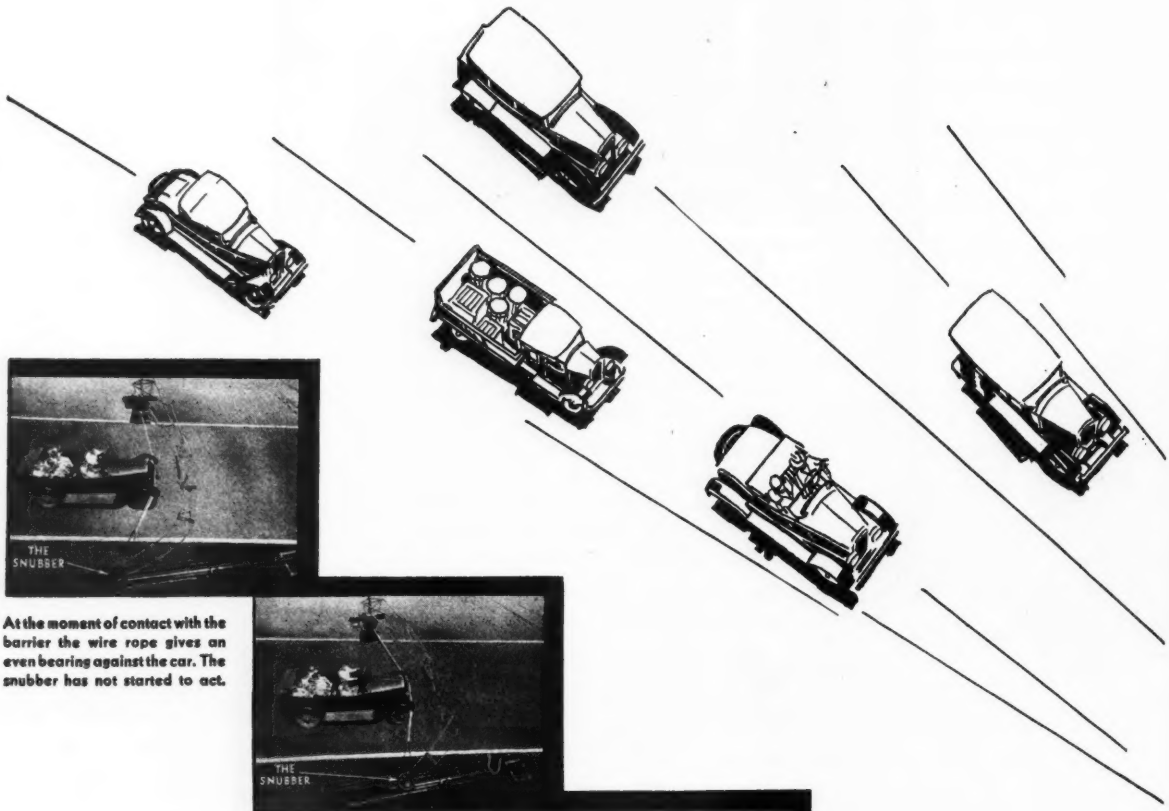
1712 Steger Bldg., 28 E. Jackson Blvd.
Chicago, Ill., U. S. A.

NORTHWEST

RP&S2-Gray

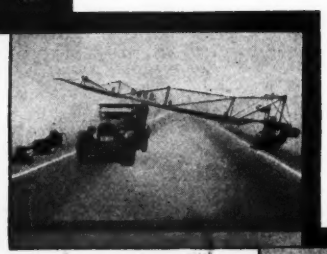
ASK ABOUT THIS NEW POWER PLANT!

More Than A Warning
The Highway Guardian



At the moment of contact with the barrier the wire rope gives an even bearing against the car. The snubber has not started to act.

Compare the position of the snubber in this picture with its position in the illustration above Here the snubber has moved to take up the shock.



If a lowering barrier comes in contact with the roof of a car it causes no damage. A pressure of 5 pounds stops its motion instantly.

Caught between lowered barriers, a vehicle can push a barrier out of the way and drive to safety. The barrier then closes and locks over the snubber.

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

---Saves Lives---Protects Property

HERE is a New barrier---THE HIGHWAY GUARDIAN---that does more than tell of approaching danger. It throws a barricade of steel and cable across the highway and defies cars or trucks to crash it, accidentally or through carelessness.

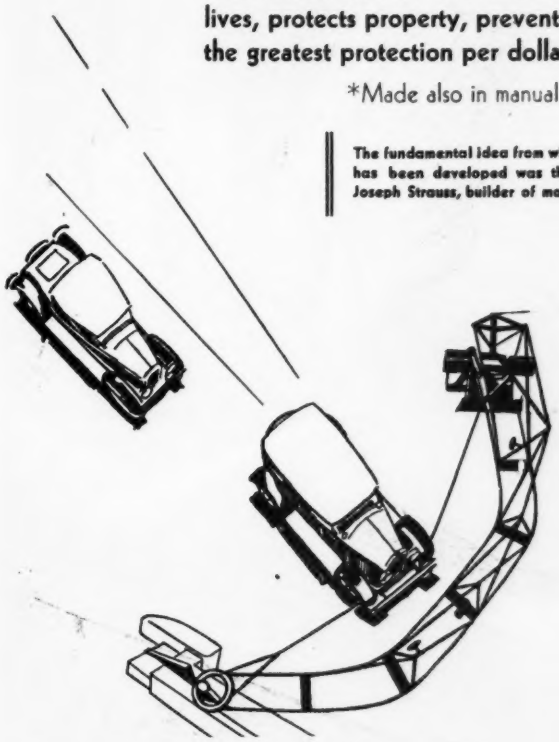
A track circuit closed by an approaching train starts this safety barrier in motion and *automatically places it across the highway. It locks over a snubber and closes the road over the tracks to traffic. Hit by an on-coming vehicle, THE HIGHWAY GUARDIAN stops it within a definite distance. A hydraulic snubber sets up a yielding resistance and takes up the shock without injury to vehicle or passengers.

In every detail THE HIGHWAY GUARDIAN does a thorough job. Vehicles caught between gates can push the barrier off the snubber and drive to safety, after which the barrier returns to the safety position and re-engages the snubber. Nor will a lowering gate damage the roof of a car. A pressure of 5 pounds stops the motion of this carefully balanced barrier.

THE HIGHWAY GUARDIAN is a positive barrier. It saves lives, protects property, prevents claims, creates good will, and gives the greatest protection per dollar invested in crossing safeguards.

*Made also in manual and semi-automatic types.

The fundamental idea from which THE HIGHWAY GUARDIAN has been developed was the ingenious conception of Mr. Joseph Strauss, builder of many of the world's famous bridges.



Bulletin No. 750 tells the interesting story of THE HIGHWAY GUARDIAN'S operation. Write for a copy.

NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

See it

at CHICAGO
TELWELD
A MILE AT A TIME

Ab-so-lute-ly nothing to do

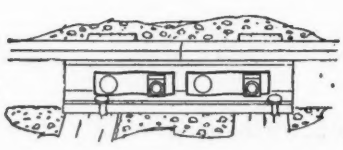
This is a picture of something that never happened.

On the best maintained track in the world there has never been a time when there was absolutely nothing to do. Maintenance engineers may grow grey hairs over the necessary jobs which they must perforce neglect for lack of money or lack of labor, but they have never been known to run out of work.

If you could release your men from any of their appointed tasks—bolt tightening, for instance—how many other tasks would claim their attention! ***Verona Rail Joint Springs*** free men from bolt tightening. After the bolts are really tight, the springs keep them tight. They need no further attention until it is time to take them out of track.

Verona Rail Joint Springs exert such a tremendous reactive pressure through such a distance, that bolt stretch, rust, wear, and all the other causes of loose bolts are immediately compensated for by the action of the springs.

Try ***Verona Rail Joint Springs*** on your new rail this year. See how many men they will release for other work.



VERONA TOOL WORKS - - PITTSBURGH

Severest Tests of Traffic over weighty fills emphasize ARMCO CULVERT *Supremacy*

TWENTY-FOUR years of rushing, rumbling traffic on rails and highways, constant or intermittent water flow, and the relentless pressure of crowding soil have failed to gauge the endurance of Armco Corrugated Iron Culverts. They go on serving as faithfully in 1930 as in 1906, when many of today's veteran Armco Culverts were installed.

This record is unequalled. It offers unquestioned proof that flexible pure iron, as found in Armco Culverts, is the one truly successful drainage material.

Evidence that many of America's foremost engineers and contractors favor this Nature-tested product is in this fact: *more than 50,000,000 feet of Armco Culverts are in use!*

Join the ever-broadening swing to Armco. New booklets tell the facts about Armco Pure Iron Culverts as developed by Armco Drainage Engineers, who are themselves at your service to aid in any drainage problem. Send the coupon.

Armco culverts and drains are manufactured from the Armco Ingot Iron of the American Rolling Mill Company and always bear its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

ARMCO

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, O.

Send booklets on Armco Corrugated Iron Culverts as applied to roadbed drainage.

Name.....

Address.....

Title.....

City..... REM2

© 1930, A.C.M.A.

DIESELS HAVE MANY ADVANTAGES FOR RAILWAY CONSTRUCTION AND MAINTENANCE

Great progress has been made in the development and application of Diesel engines in the past 10 years. With pioneering vision, Bucyrus-Erie saw that Diesel engines were especially suited for railroad work. Bucyrus-Erie built the first Diesel shovel, the first Diesel dragline, and was first with four other types of Diesel excavating machines. Bucyrus-Eries with Atlas-Imperial Diesel engines have been made continuously by this company for the past 8 years and are operating with complete satisfaction all over the world today. These Diesels have the power to meet abnormal demands. Power that is hard to stall. Fuel cost is but a fraction of that for gasoline engines, and fire hazard is reduced to the minimum. Diesel Shovels, Cranes, Clamshells, Draglines are built by Bucyrus-Erie in 1/2 to 2-yard capacities. Rugged simplicity keeps these Diesels on the job. They have a reputation for *dependable performance.*

BUCYRUS ERIE

Power shovels, clamshells, cranes, draglines, dragshovels—½ to 16-yard capacity—electric, steam, gasoline, Diesel, gas + air, Diesel + air.

Dipper, hydraulic and placer mining dredges.

A-43-2-30-REM

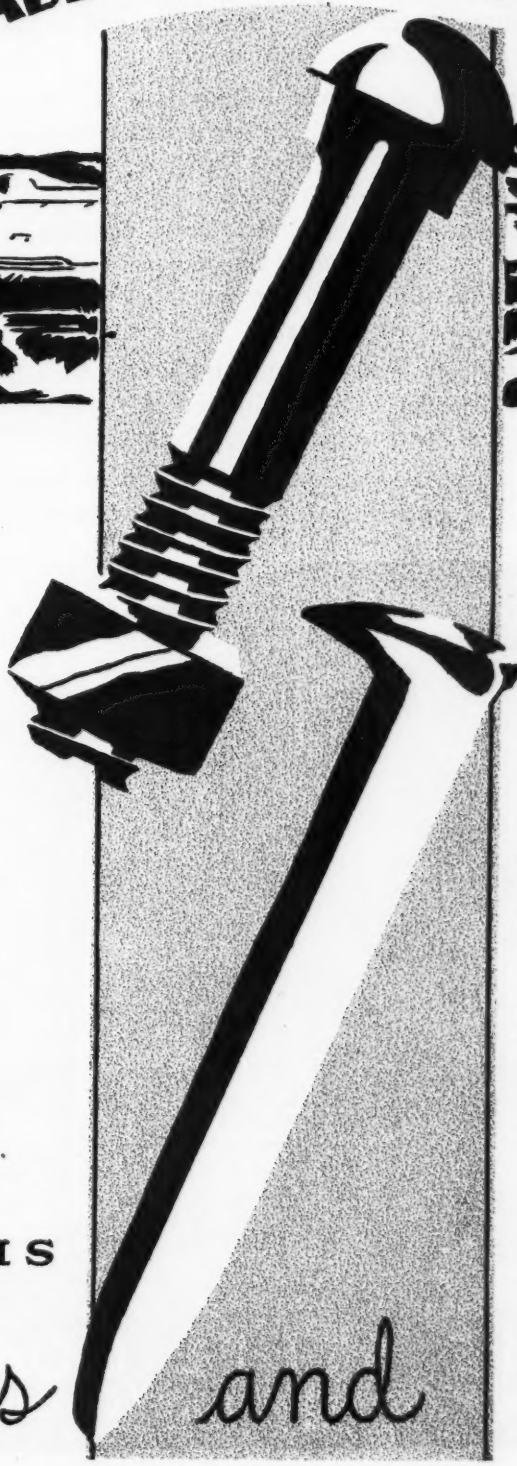
We will gladly co-operate with you and help you choose the machine for your needs. World wide service goes with every sale.

BUCYRUS-ERIE COMPANY

PLANTS: South Milwaukee, Wis., Erie., Pa., Evansville, Ind. GENERAL OFFICES: South Milwaukee, Wis. BRANCH OFFICES: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco. Representatives throughout the U. S. A. Offices or distributors in all principal countries.

mypm
MORE YARDS PER MONTH

DEPENDABLE SPIKE & BOLT SERVICE



... Whether you want immediate or future shipment, the Illinois Steel Company is equipped to meet your requirements.

... Our plant, located in the Chicago Metropolitan Switching district, assures delivery to your railroad in the shortest possible time.

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices
208 South La Salle Street, Chicago

ILLINOIS STEEL

Spikes and Bolts

CARNEGIE BEAMS

for grade-crossing elimination work

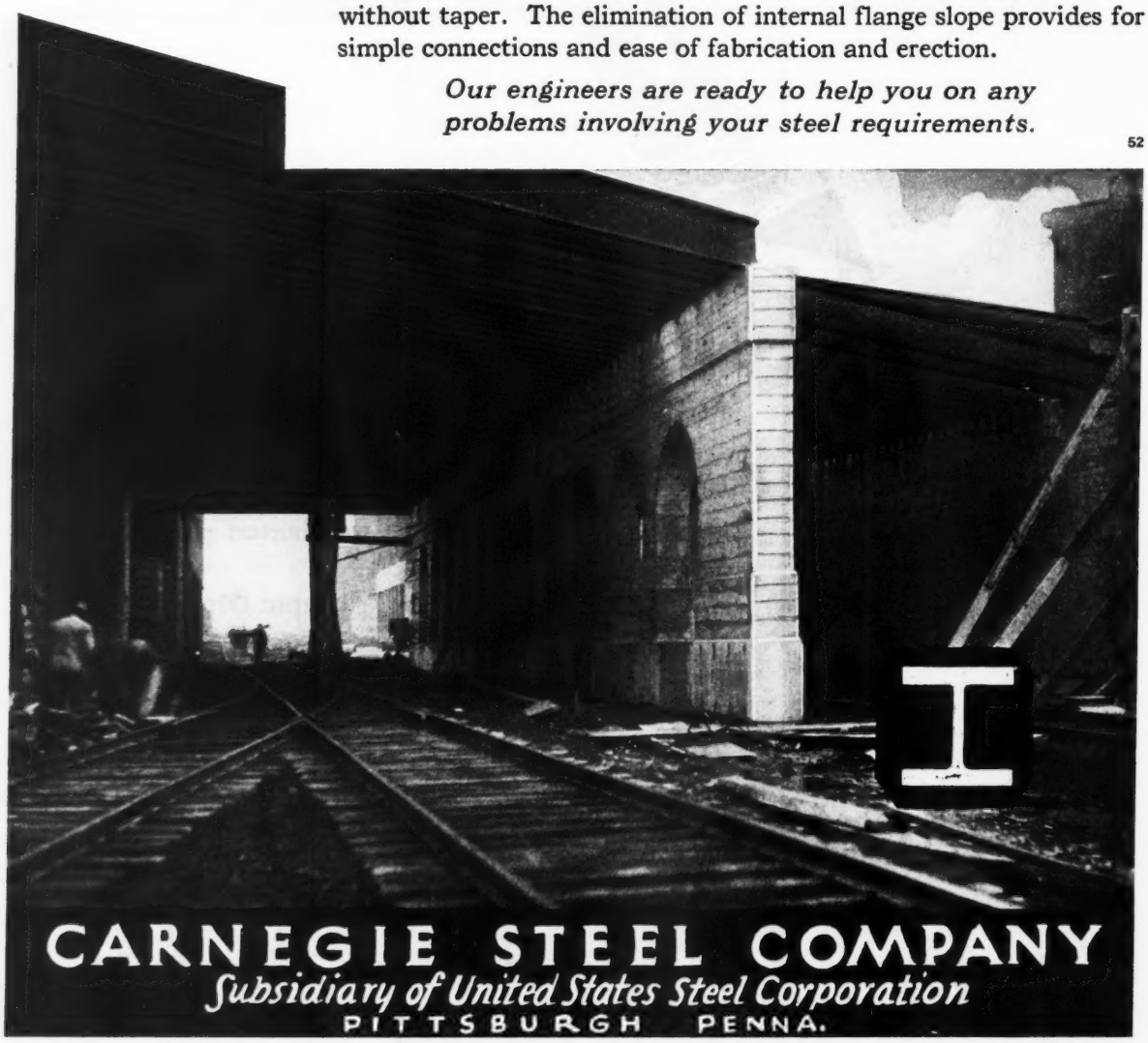
A simple and economical solution of the problems of highway and maintenance of way engineers engaged in grade separation work is offered by Carnegie Beams.

This series of sections comprises a full range of beam, girder and column sections of high efficiency as measured by the ratio of section modulus to the weight. The heavier sections, designed primarily for heavy loads on long spans with the least loss of head room, will prove especially valuable. These sections up to 36 inches deep, offer a wide selection of flange widths and section moduli as high as 1102.7 inches^3. They eliminate the fabrication necessary in built-up plate and angle girders.

Carnegie Beams are characterized by flanges of uniform thickness without taper. The elimination of internal flange slope provides for simple connections and ease of fabrication and erection.

Our engineers are ready to help you on any problems involving your steel requirements.

52



CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH PENNA.

IMPROVED
WOODINGS ANCHOR

EASILY APPLIED

DEPENDABLE

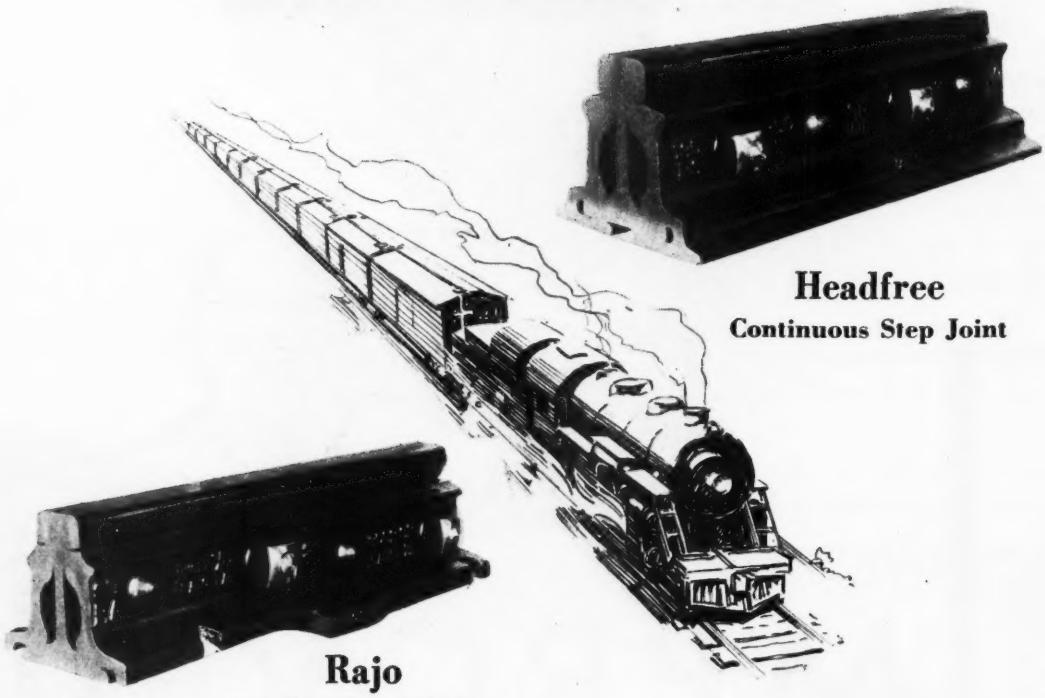
ECONOMICAL

WOODINGS FORGE & TOOL CO.

WORKS AND GENERAL OFFICES

VERONA, PENNA.

KEEP BOTH OLD AND NEW RAILS UP IN LINE AND SURFACE



Headfree
Continuous Step Joint

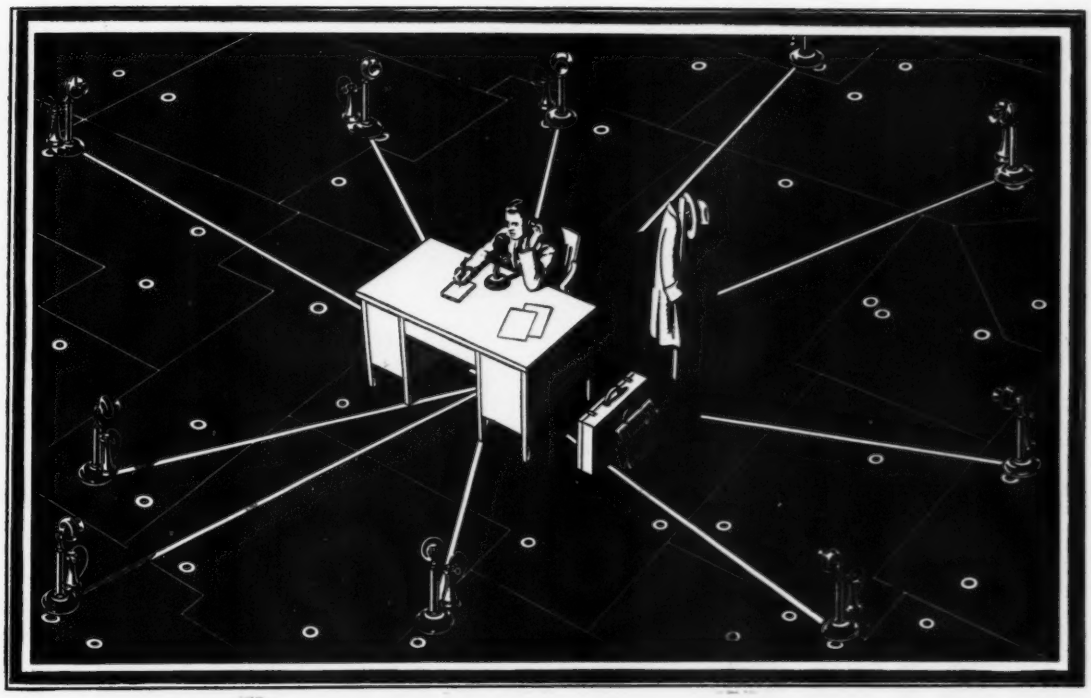
Rajo
Headfree Step Joint

HEADFREE Joints engage the rails at the head fillets. Where it is necessary to connect two different sections of rail, this Headfree feature in Step Joints is most important, because it tends to lessen building up the old section approximately 30%, saves wear of the new rail, reduces rail batter and tends to keep both sections up in line and surface—a smooth rail surface.

Worth Investigating

THE RAIL JOINT COMPANY
165 Broadway, New York City

They Cover their Territory twice as often by Telephoning from Key Towns



A MANUFACTURING company, marketing its product nationally, was faced with serious competition. Its salesmen could visit customers only at intervals of several months. They could give little time to developing new prospects. Regional mills and other competitors were making deep inroads into its business.

A Key Town Plan of telephoning was presented to this company and adopted. Its use enables the salesmen to cover their territory at least twice as often, at proportionately lower cost.

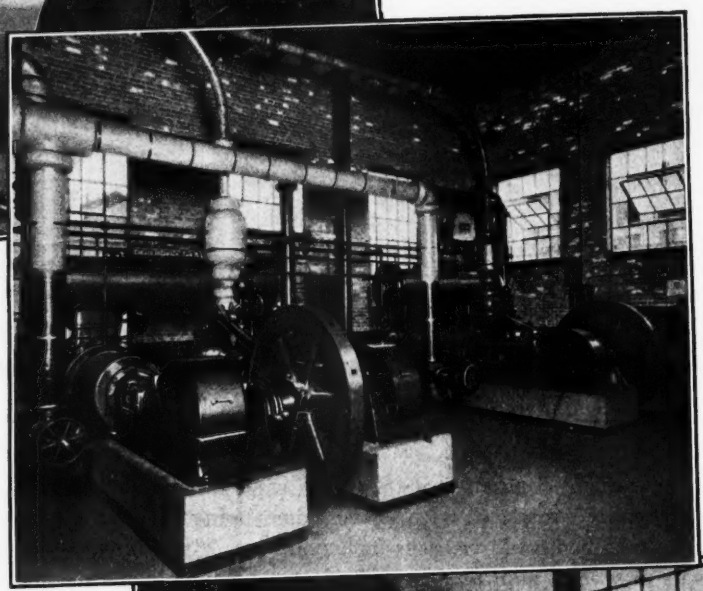
The Key Town Plan is used by many business firms to meet modern conditions. Under this method, the representative goes to the key cities in person. From these he conducts his business in the surrounding area by telephone, buying and selling goods, building good-will, answering questions, adjusting complaints, quoting prices or specifications.

In this way he can cover territory far more quickly. Many business men alternate personal visits with telephone calls, visiting certain cities on one trip and telephoning nearby ones, and reversing the procedure the next.

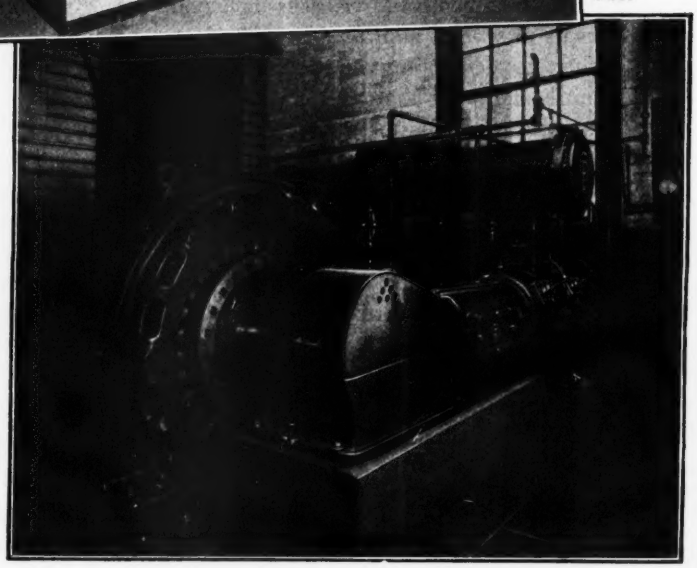
There is now in effect a further reduction in various long distance rates, saving telephone users of the United States more than $5,000,000 a year. This is the fourth reduction within little more than three years. It is part of the fundamental policy of the Bell System, which is to provide the best possible telephone service at the least cost to the public. Out of town calls are *Quick . . . Easy . . . More economical than ever.*

CP COMPRESSORS
Recently Installed By Three Large Railroads

These installations are repeat orders from three prominent railroads whose experience with CP Compressors has proved their reliability and high sustained efficiency.



C-283



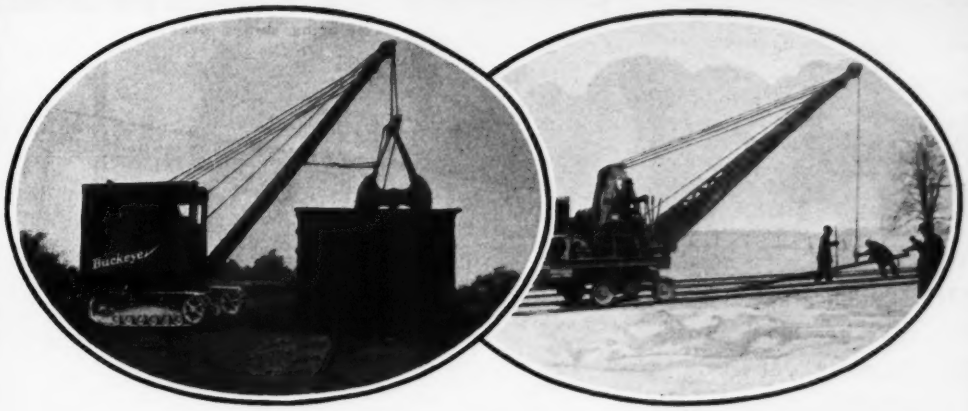
The Simplate Air Valve; the piston type of steam valve; efficient regulation of both the steam and motor-driven types; sturdy construction; reliable automatic lubrication and world-wide CP service facilities are some of the reasons why CP Compressors are preferred by Railroad engineers.

There is a CP Compressor, stationary or portable, in steam, oil, belt or direct motor driven type, for every compressed air purpose. Write for literature.

Chicago Pneumatic Tool Co.
Railroad Dept.

6 East 44th St. - - - - - - - New York
310 S. Michigan Ave. - - - - - Chicago
1004 Mutual Bldg. - - - Richmond, Va.
175 First St. - - - - - - San Francisco
Terminal Tower - - - - - - Cleveland

UTILITY



A material handling job? New rails to be laid? Machinery to be moved? A grading job? Coal, sand, or gravel to be loaded or unloaded? The Buckeye Utility Crane will do it! Easily! Swiftly! Better!—with economy of time and labor. Then it is ready for another job.

This Utility Buckeye is quickly convertible to a wide range of service—Clamshell, Dragline, Orange-peel, Backfiller or Crane. Its profitable applications are limited only by the ability of the operator and the ingenuity of the supervisor in adapting his work to it. *"Every day it pays its way."*

Outstanding among the operating features of the Buckeye Utility Crane are: Two speeds for all operations; full-circle swing; and adjustable length boom. Available in two mountings, it can be furnished with Alligator (Crawler) Wheels for work independent of roadbed, or with Flanged Wheels for operation from main track or rails laid on flat cars.

Write for free bulletin describing fully its construction and performance.

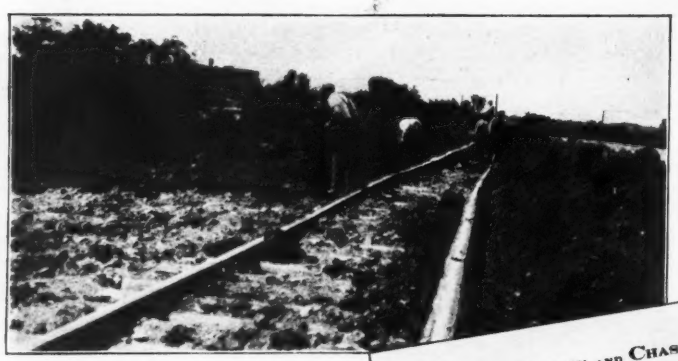
THE BUCKEYE TRACTION DITCHER COMPANY, FINDLAY, OHIO

There's a Buckeye Sales and Service Office Near You

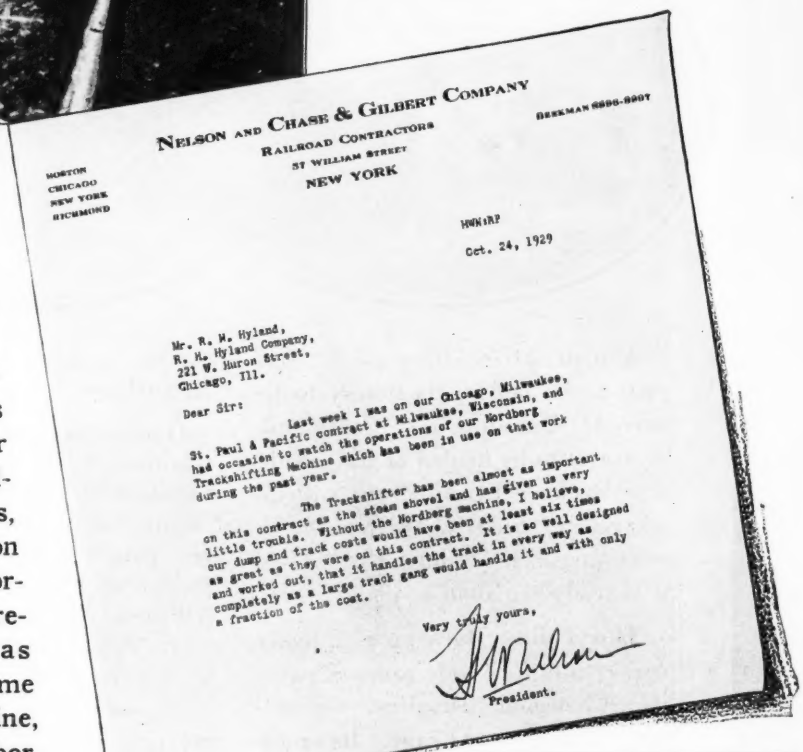
for over thirty years

Buckeye

Shifting track by machine saves 83% of track labor expense



In the illustration at the bottom can be seen the piles of clay dumped at either side of the track and used in building the fill for a railroad yard. At the left, the track has been raised and is being shifted over to the edge of the dump.



NELSON AND CHASE & GILBERT COMPANY
RAILROAD CONTRACTORS
37 WILLIAM STREET
NEW YORK
BOSTON
CHICAGO
NEW YORK
RICHMOND
BEEKMAN 8800-8807

HWN:RP

Oct. 24, 1929

Mr. R. W. Hyland,
R. W. Hyland Company,
221 W. Huron Street,
Chicago, Ill.

Dear Sir:

Last week I was on our Chicago, Milwaukee, St. Paul & Pacific contract at Milwaukee, Wisconsin, and had occasion to watch the operations of our Nordberg Trackshifting Machine which has been in use on that work during the past year.

The Trackshifter has been almost as important on this contract as the steam shovel and has given us very little trouble. Without the Nordberg machine, I believe, our dump and track costs would have been at least six times as great as they were on this contract. It is so well designed and worked out, that it handles the track in every way as completely as a large track gang would handle it and with only a fraction of the cost.

Very truly yours,

President.

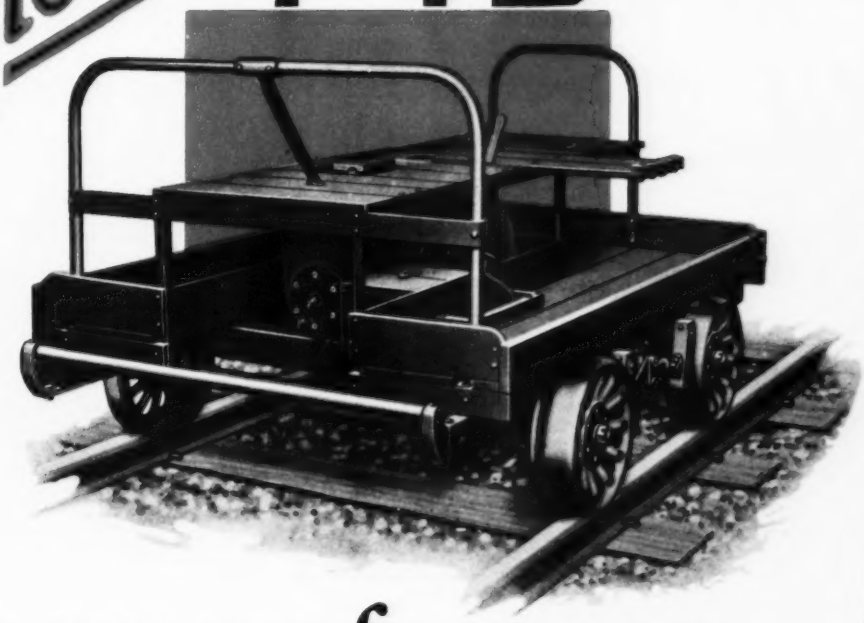
WHILE such a saving may seem extravagant to some, yet it is the invariable report received from users of the Nordberg Track Machine. Wherever track is raised or shifted, similar savings are possible. Building fills and waste dumps, grade raising, construction projects, etc., offer opportunities for materially reducing labor expense, as compared with the old time hand methods. This machine, its operator and a few laborers replaces the normal track gang working with jacks and bars.

Let us tell you more about its labor saving possibilities.

Nordberg Mfg. Co.
Milwaukee, Wis.

NORDBERG

"Sheffield" "44B"



1930 begins the SECOND CENTURY of building FAIRBANKS SCALES

Motor car performance

is not built on "here and there" features

An improved fastening here. A sturdy bracing there. Commendable features, no doubt, but often given unwarranted prominence in selling motor cars. Experienced buyers know that *every part* of a railway motor car must be built as well as those "special" features or interrupted service and high maintenance costs will follow.

Sheffield Motor Cars, of course, have desirable and important construction characteristics. This is natural as "Sheffield" design—the result of over 34 years of experience—is far in advance of the field. Yet you are not urged to buy a "Sheffield" because of two or three "features."

Every part of the Sheffield Motor Car will stand the closest inspection as to design, material and workmanship. *Every part* is built to give maximum service. There is no compromise to price. No cheapened construction that needs to be covered up by drawing attention to minor refinements. Because "Sheffield" is soundly constructed *throughout*, it is the *lowest overall cost* car on the market.

Before you buy a railway motor car, get the facts about "Sheffield." You will then understand why this car has a record of performance that is conspicuous for dependability, long life and low maintenance.

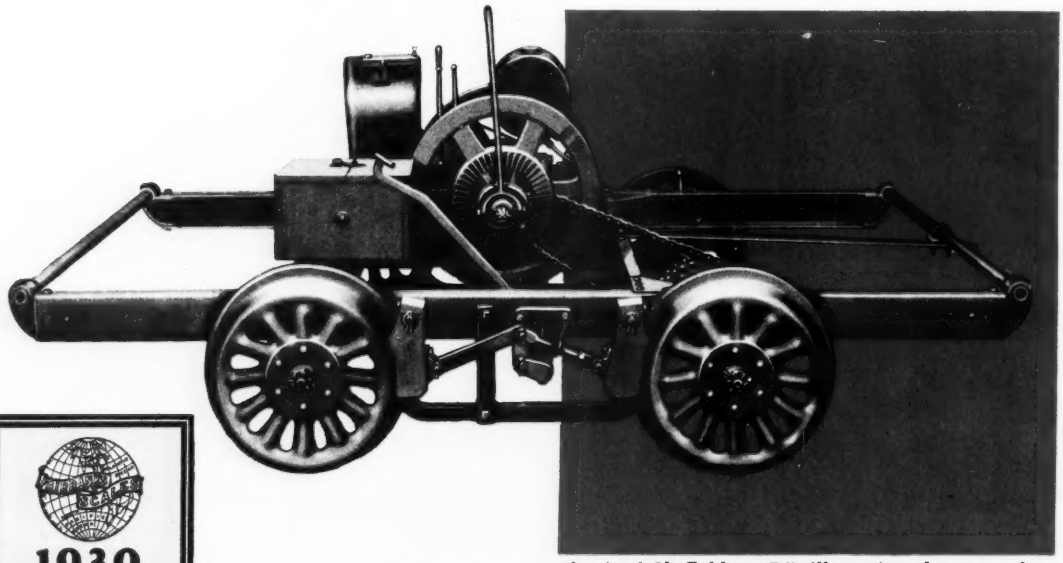
TIMKEN BEARING EQUIPPED

First on the rails... and still first

FAIRBANKS-MORSE MOTOR CARS

F M

Built *soundly* from the ground up



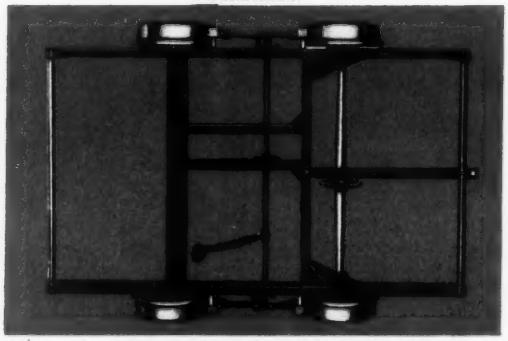
Chassis of Sheffield "44B," illustrating the strong but light steel frame and sturdy foundation for the engine. Notice, also, the complete accessibility of the engine and transmission.

1930
begins the SECOND CENTURY of building FAIRBANKS SCALES

Railroad men have learned to expect more from Sheffield Motor Cars than from any other make—greater dependability, lower maintenance, longer life. Sheffield Railway Motor Cars set unparalleled performance standards because *every part* of these cars is built to give maximum service. There are no "weak links" in Sheffield construction.

Examine the frame of the Sheffield "44B," for example. This unit is made from special frame steel. The construction is similar to that used in automobiles—employing both die formed channel and tubular cross members. All frame members are carefully riveted. This type of construction provides flexibility with strength sufficient to withstand shocks that would demolish a wood frame, and it forever holds parts in proper alignment.

Every part of the Sheffield "44B" is built to the same high construction standard. Engine, clutch, transmission, body, brakes, axles, wheels—all play an important part in delivering the low cost performance which you can expect from every "Sheffield."



Top view of frame illustrating the heavy channels die pressed from special frame steel and the reinforcing gusset plates to brace the cross members.

TIMKEN BEARING EQUIPPED

FAIRBANKS, MORSE & CO., Chicago

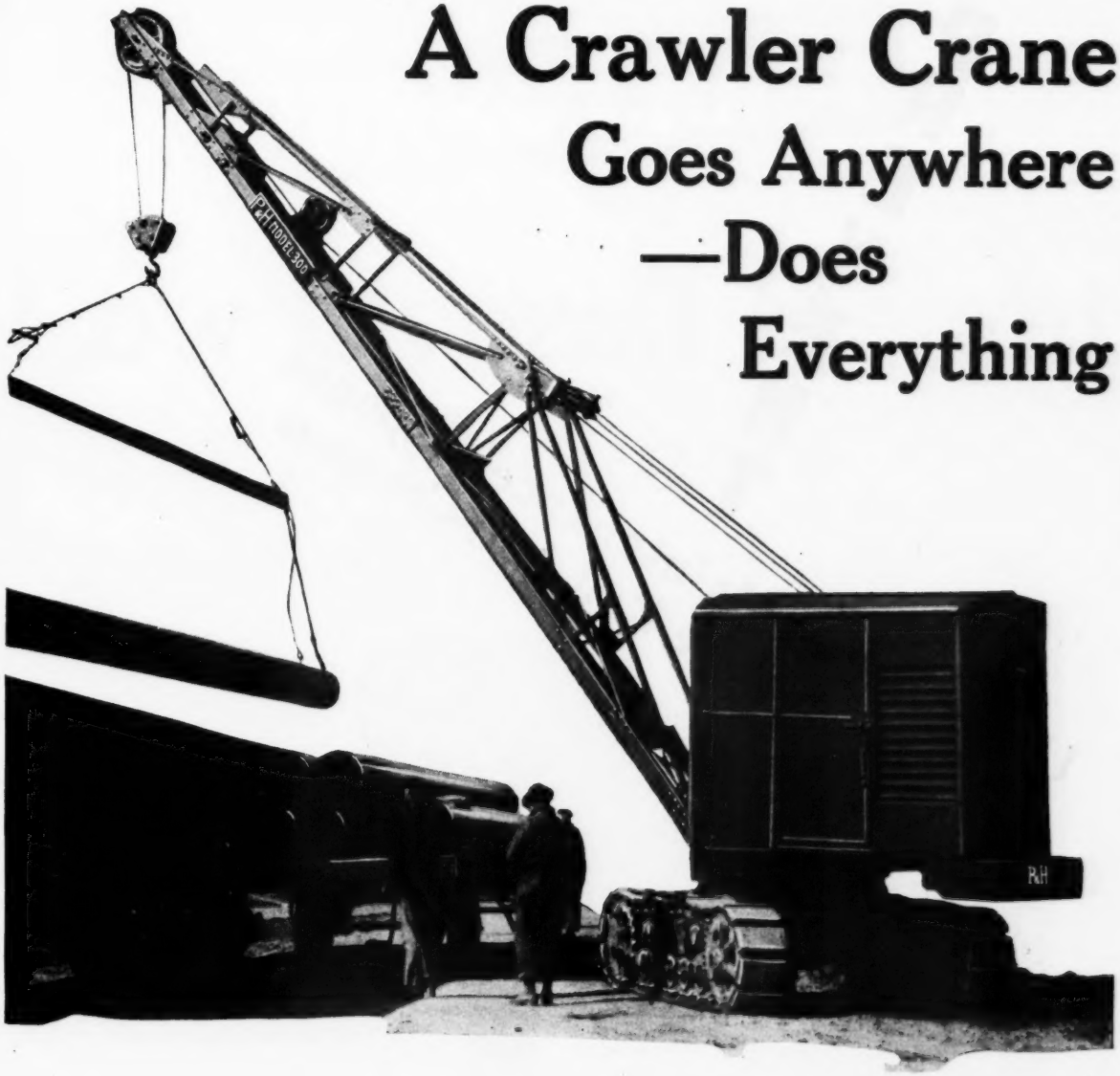
Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; stationary and marine oil engines; steam, power and centrifugal pumps; scales; motors and generators; complete coaling stations.

First on the rails...and still first

RA21.69

FAIRBANKS-MORSE
MOTOR CARS

A Crawler Crane Goes Anywhere —Does Everything



P&H

CORDUROY
(CRAWLER)
CRANES

Capacities

7½, 10, 12½, 15, 20 TONS

The Crawler Crane is being adopted by railroads for many reasons. In the first place it is ready to go anywhere at any time. It will work from a standard flat car or on the ground—will load itself onto or unload itself from a flat car under its own power.

A P & H Crane will utilize a clamshell bucket or hook and sling equally well. The shift from one to the other is quickly and easily made.

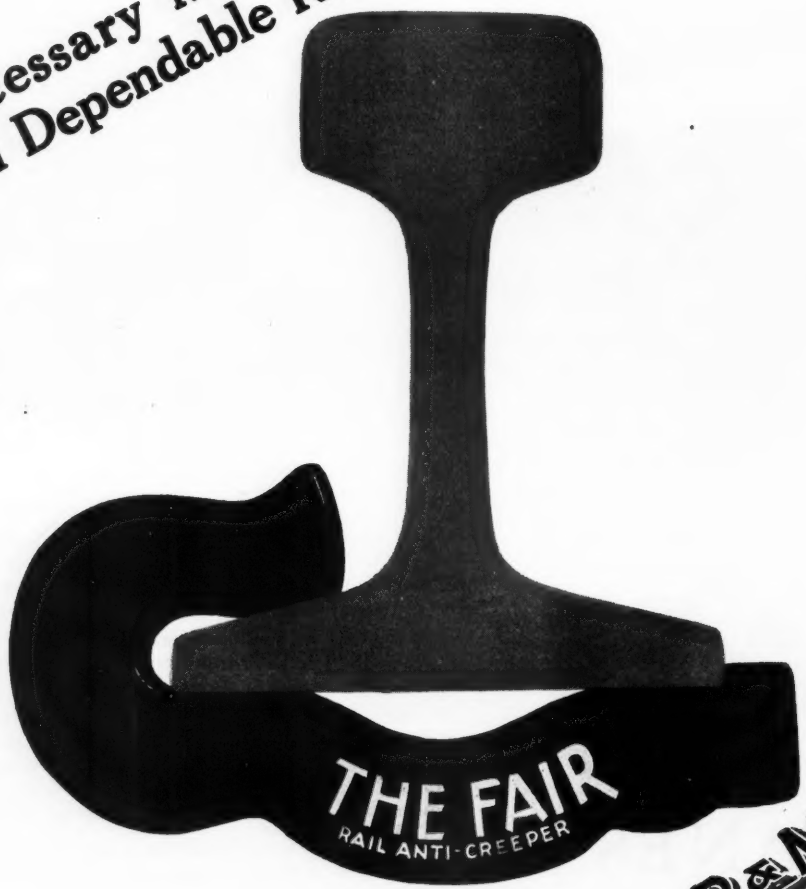
In handling supplies, scrap, rails and ties with a P & H Crane the cost has been reduced to approximately one-twentieth that of hand labor. Among the many roads using P & H's are: C. M. St. P. & Pacific R. R.; Union Pacific; Southern Pacific; Mobile and Ohio; Delaware and Hudson; Southern Railway; Seaboard Airline, and K. C. M. & O.

Let our Railroad Department give you complete details.

HARNISCHFEGER CORPORATION
Established in 1884
3820 National Avenue, Milwaukee, Wis.
OFFICES AND AGENTS IN ALL PRINCIPAL CITIES
Warehouses and Service Stations: Hoboken, Memphis, Jacksonville, San Francisco, Los Angeles, Seattle, Dallas.

PREVENT

Unnecessary Maintenance Expense
with Dependable Rail Anti-Creepers



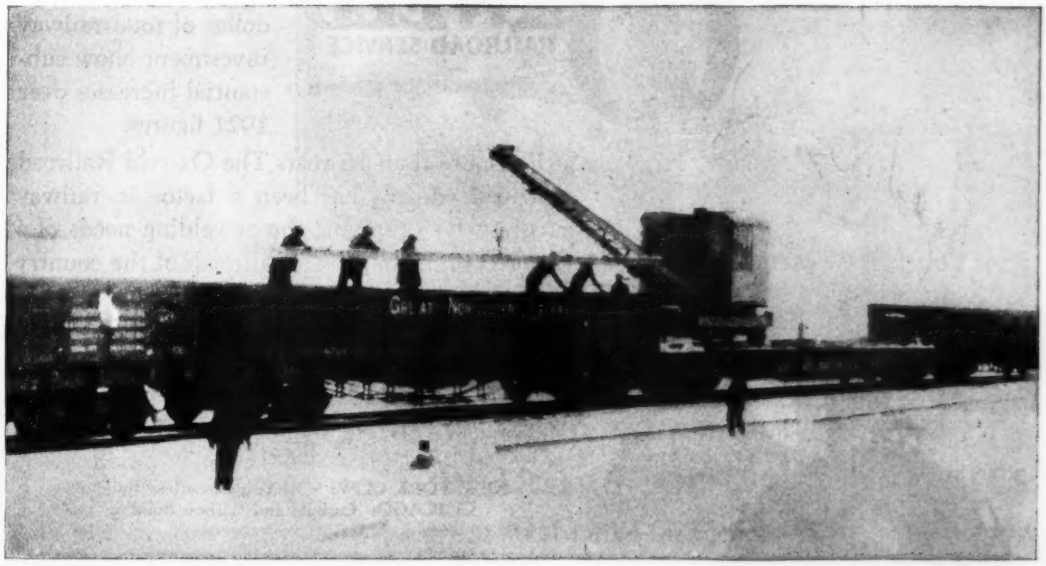
THE P & M. CO.
NEW YORK
CHICAGO LONDON PARIS
MONTREAL SYDNEY
CALCUTTA

Model 20

BURRO CRANE

Model 30

Low Overall Height *Is Economy*



Standard Burro Crane on a flat car in a work train distributing new rail. The Burro is mounted on rails so it can travel back and forth and can work from any part of the car.

Burro Features

Utility
Long Reach
Low Overall Height
Travel Speeds
1½ to 20 miles per hour
Draw-Bar Pull
6000 to 7000 lbs.

Rated Capacities
Model 20 . . . . 11,000 lbs.
Model 30 . . . . 14,700 lbs.

Burro Crane low overall height, only 11'-0", gives the Burro a wider range of operation. This is due to the fact that the standard crane can be operated on a car in a work train, as well as on standard gauge track.

Loading and unloading the Burro is easily accomplished by running the crane up or down an incline composed of two 33' or two 39' rails. The crane has ample power to propel itself up this incline.

This flexibility of operation means increased uses for the Burro, together with the elimination of idle periods, resulting in greater return from the investment.

Cullen-Friestedt Company, 1300 South Kilbourn Avenue, Chicago

Five Billions

—since 1921!

INCREASED operating efficiency in the past seven years has enabled American Railroads to pass on to the public, through gradual reductions in freight and passenger rates, savings averaging better than $6.00 per year for every man, woman and child in the United States—a staggering total of more than five billions of dollars. At the same time average annual wages of railway employees and net earnings per dollar of total railway investment show substantial increases over 1921 figures.

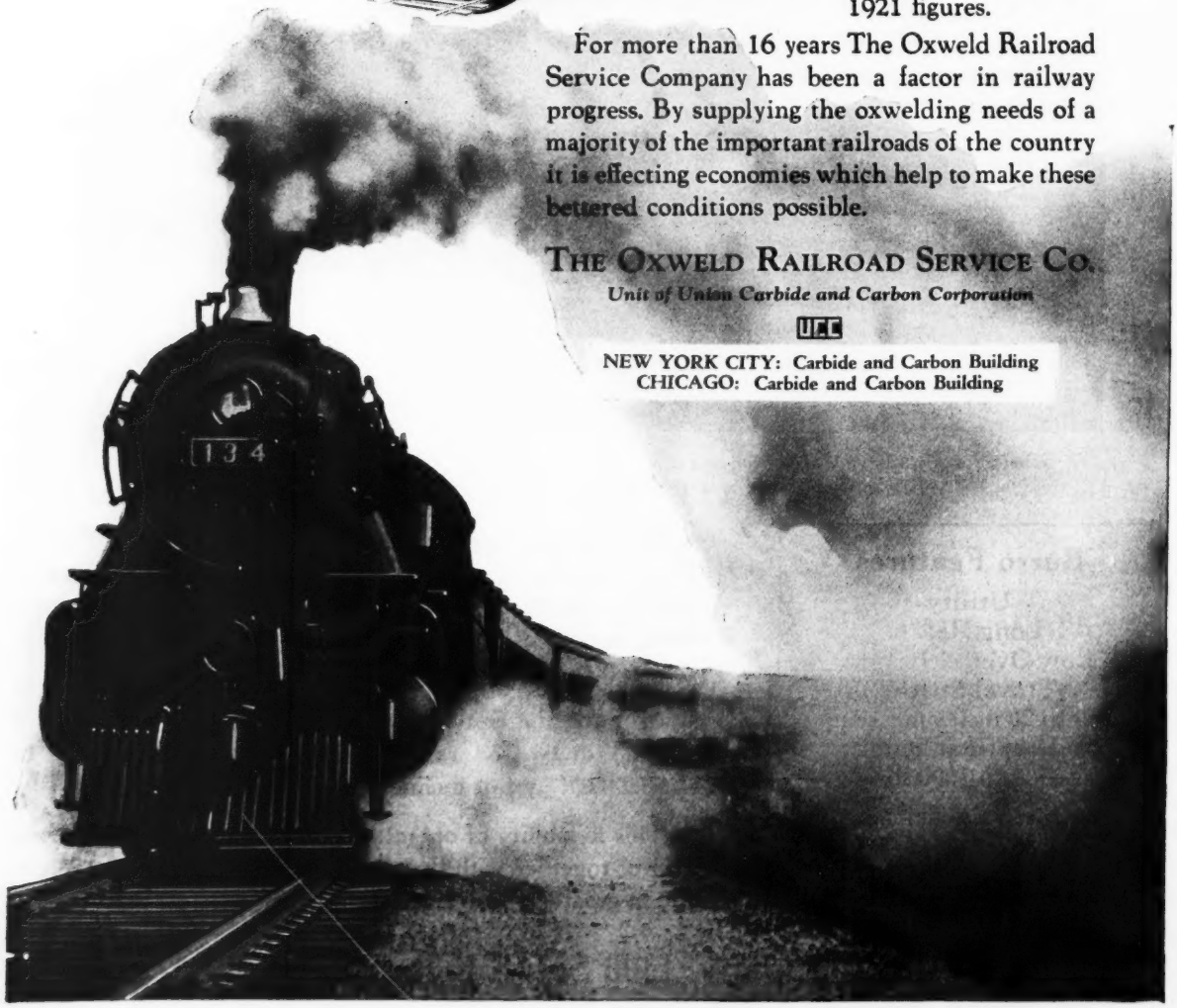
OXWELD RAILROAD SERVICE

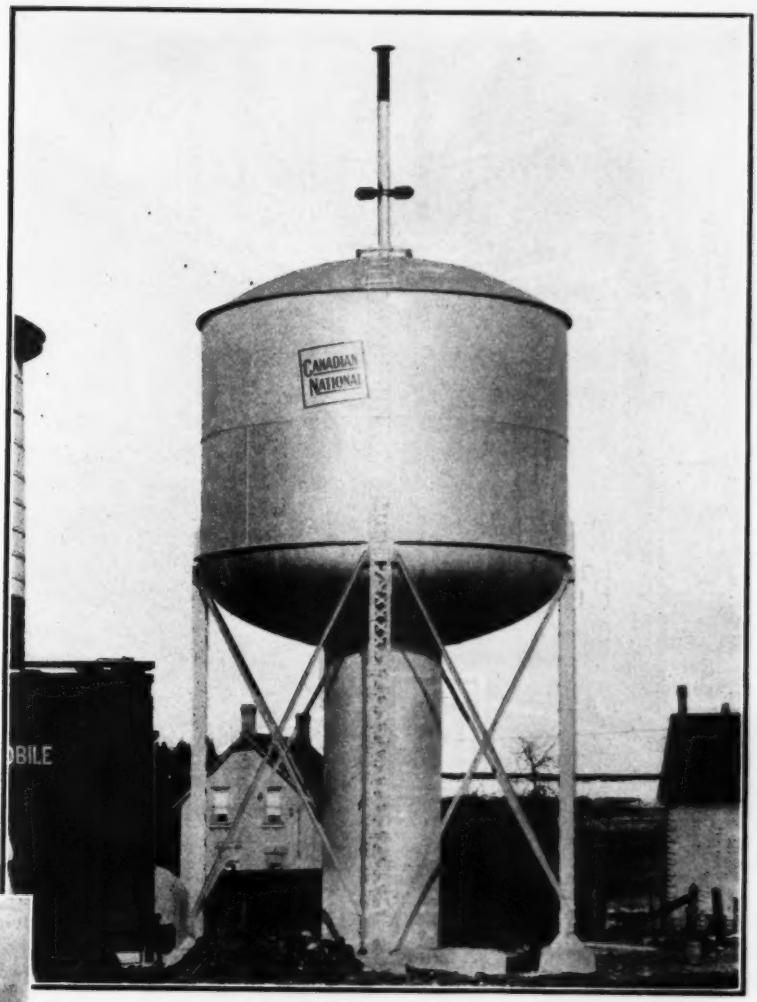
For more than 16 years The Oxweld Railroad Service Company has been a factor in railway progress. By supplying the oxwelding needs of a majority of the important railroads of the country it is effecting economies which help to make these bettered conditions possible.

THE OXWELD RAILROAD SERVICE CO.
Unit of Union Carbide and Carbon Corporation

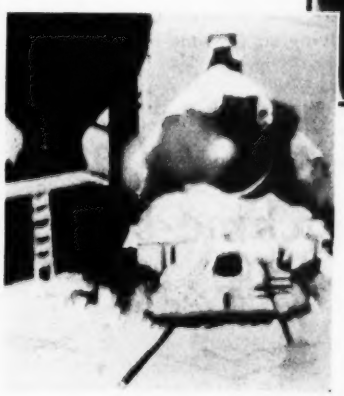
UCC

NEW YORK CITY: Carbide and Carbon Building
CHICAGO: Carbide and Carbon Building





Right: 40,000-gallon Horton tank on Canadian National at Hanover, Ontario. It is equipped with a heater. Below: Locomotive taking water from a tank in Winter.



Steel tanks for cold climates

Horton steel tanks for locations where extremely cold weather is probable in Winter are often equipped with heating equipment to prevent freezing. It consists of an efficient coal-fired heater located in a heating chamber formed by placing a diaphragm in the riser. A 20-inch flue extends up through the center of the tank. By heating the bottom, a column of water through the center and the top of the tank, the water in it is kept circulating sufficiently to prevent freezing.

In Canada
HORTON STEEL WORKS
LIMITED
Toronto, Ont. Montreal, Que.
Bridgeburg, Ont.

CHICAGO BRIDGE & IRON WORKS

Chicago	2452 Old Colony Bldg.	Detroit	1519 Lafayette Bldg.
New York	3156 Hudson Term. Bldg.	Philadelphia	1609 Jefferson Bldg.
Cleveland	2202 Union Trust Bldg.	Atlanta	1036 Healey Bldg.
Dallas	3309 Magnolia Bldg.	San Francisco	1007 Rialto Bldg.
Boston	1522 Consolidated Gas Bldg.	Havana	Apartado 2507

B-123

HORTON TANKS

An I-R Tie Tamper Compressor supplying air for sand-blasting

Keeping a busy machine busier

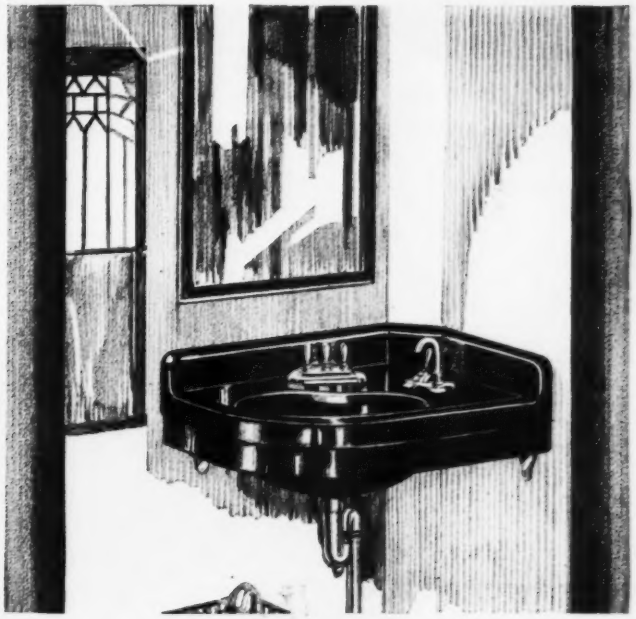
All-season use of equipment helps pay the biggest dividends on the investment. With the wide variety of work called for in maintenance operations, I-R Tie Tamper Compressors are used to advantage on many operations besides tamping.

Records show that I-R Tie Tamper Compressors have been employed in more than thirty different ways on rail laying, bridge and building operations, and general work along the line. Savings in time and labor are being made every month of the year with these machines.

INGERSOLL-RAND COMPANY - 11 Broadway - New York City
Branches or distributors in principal cities the world over
For Canada refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec

274-TT

Ingersoll-Rand



Color in plumbing fixtures is as logical as roller bearings, and as modern

THE luxury and comfort of plumbing fixtures in color are no more illogical than the roller bearing wheel. Both help to make the journey more pleasant and agreeable. And both are a modern development of today's highly perfected transportation service.

"Standard" Plumbing Fixtures may now be obtained in Meissen White, Ionian Black and the following eight colors: T'ang Red, Ming Green, Royal Copenhagen Blue, Clair de Lune Blue, Rose du Barry, Orchid of Vincennes, Ivoire de Medici, and St. Porchaire Brown.

Too modern for your present acceptance? Not more so than half a score of recent additions to the list of comforts added to de luxe trains. You could add nothing that your patrons would more quickly appreciate, or more certainly commend.

If interested in color in plumbing fixtures, or in the replacement of existing lavatories with "Standard" genuine vitreous china in spotless white, we suggest you write for our catalogue. Why not do so today?

Railroad Fixture Department

Standard Sanitary Mfg. Co. PITTSBURGH

Division of

American Radiator and Standard Sanitary Corporation

THE LARGEST MANUFACTURER OF PLUMBING FIXTURES IN THE WORLD

Toncan Iron Gives Permanence To The Corrugated Culvert

CULVERTS of flexible corrugated metal have proven their value for many years.

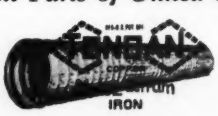
They adjust themselves to shifting of the fill and have the required strength to resist vibrations and the pressures of swelling or freezing soils.

But acid waters and unfriendly soil conditions shorten the life of the ordinary metal culvert. Hence the importance of specifying culverts of Toncan Iron—the culvert metal most resistant to rust and corrosion.

Toncan Iron builds up its well-known resistance to corrosion and erosion by the inclusion of copper and molybdenum. These elements give the naturally resistant iron a still further protection against rusting and corrosion. For permanence at reasonable cost, install Toncan Iron culverts.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION, MASSILLON, OHIO

Plants located in all Parts of United States and Canada



TONCAN COPPER MO-LYB-DEN-UM **IRON**

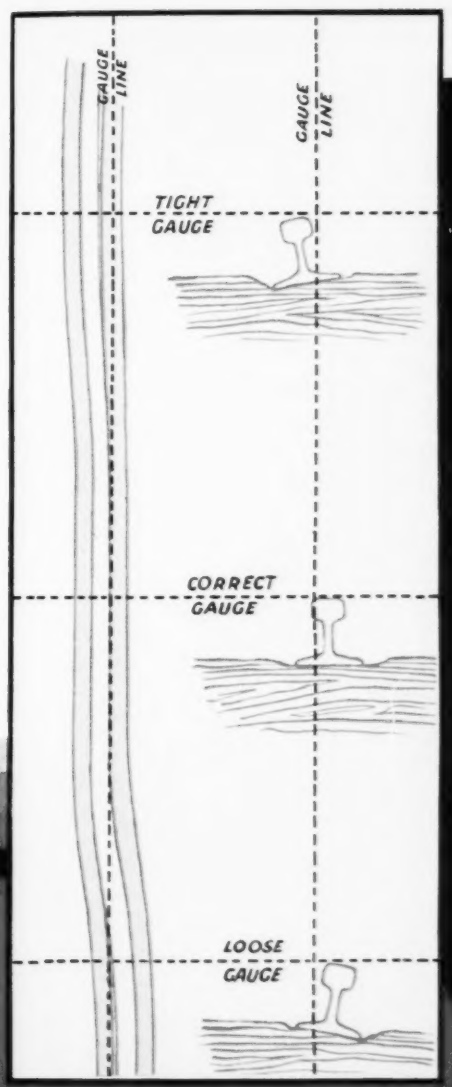
REGAUGING ELIMINATED

Torsional Strains Prevented

Rail seats cannot be adzed by hand to the same plane when relaying track, consequently the rails tip under traffic to reach a solid bearing. This sets up torsional strains in rails and throws track out of gauge as well as out of line. The diagrams indicate (exaggerated) just how this occurs.

But with Nordberg Adzing Machines, every rail seat must come to the same plane. This prevents torsional strains in rails and produces relayed track which will hold its line and gauge.

Thus Nordberg Adzing Machines produce triple savings—an enormous saving in cost of adzing and large savings in regauging and realigning.



Black line shows correct gauge line of rail, and cross-sections at right indicate way rail is tipped out of line and gauge and torsional strains set up by imperfect hand adzing.

NORDBERG MFG. CO.

Tie Adzing Machines ▼ Power Track Jacks ▼ Track Shifters

Milwaukee, Wisconsin

Re-Setting Re-Raising-Re-Aligning

ALL REDUCED TO A FRACTION

THE Nordberg Power Jack effects enormous saving in track lifting. It also makes possible a much better surface on track because of its screw type lift which permits hair line accuracy of control, instead of notch by notch control.

When track is lowered by a Nordberg Power Jack it is let down gradually —not dropped on the ballast as with hand jacks. Hence excessive settling is eliminated and the necessity for re-setting jacks and re-raising track eliminated.

The Nordberg Power Jack also eliminates expensive re-aligning. It does not kick out on soft footing like hand jacks, and thus shove track out of alignment. Nor is there any possibility of setting it crooked as there is with hand jacks. And because of its 6½ by 50 inch shoe it does not slide or tilt, and does not distort alignment, even on curves.

Maintenance dollars go many times farther with Nordberg Power Jacks on ballasting gangs. It will pay you to investigate their records on many trunk line railroads. Now is the time to find out how to save money on next spring and summer's work.

NORDBERG MFG. CO.

Tie Adzing Machines ▼ Power Track Jacks ▼ Track Shifters

Milwaukee, Wisconsin

Proved PROTECTION *for* Iron *and* Steel

Proved by the rigid tests of experts . . . *proved* by its continued use for more than 100 years—pure red lead is recognized as the standard protective paint for metal.

On railroads, in the shipyards . . . and on bridges, tanks and steel structures of every type . . . you'll find red lead paint in excellent condition after exceptionally long periods of service.

That is why paint authorities say: "Three coats of pure red lead give protection for metal that is unexcelled in length of life."

Fine, uniform, highly oxidized . . . there is no better red lead obtainable than Dutch Boy red lead. It comes in two forms . . . paste and liquid. The liquid (ready for the brush) is supplied in six colors — natural orange-red, light and dark brown, light and dark green, and black. The paste comes in natural orange-red and can be shaded to dark colors.

DUTCH BOY SOLDER

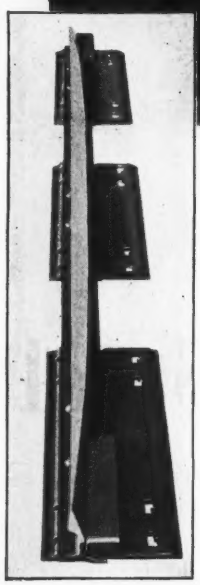
Another Dutch Boy product is solder. There is a Dutch Boy solder for every purpose, each bar or ingot carrying a number to indicate its exact composition. Dutch Boy 111, for example, contains 50% tin and 50% lead.

NATIONAL LEAD COMPANY

New York, 111 Broadway • Buffalo, 116 Oak Street Chicago, 900 West 18th Street • Cincinnati, 659 Freeman Ave. • Cleveland, 820 West Superior Ave. • St. Louis, 722 Chestnut St. • San Francisco, 235 Montgomery St. • Boston, National-Boston Lead Co., 800 Albany St. • Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Ave. • Philadelphia, John T. Lewis & Bros. Co., Widener Bldg.

DUTCH BOY RED LEAD

Bethlehem Hook Flange Guard Rail installed on high-speed, main line.



The Bethlehem Hook Flange Guard Rail is furnished, shipped and installed as one-piece. It is complete in itself, requires no extra parts and obviates the use of clamps, braces, tie plates and bolts. Special spike hold notchings in base plates permit adjustment for wear or flangeway widths.

It's rolled steel one-piece construction *means* Safety

The Bethlehem Hook Flange Guard Rail is designed with resilience to "cushion" the impact of wheel flanges and to permit improperly mounted wheels or thick flanges to pass through safely.

Thousands of Bethlehem Hook Flange Guard Rails have been in severe service for years; not one has ever broken. They are unbreakable.

Rolled from high-quality steel to the general shape of a standard tee rail the Bethlehem Hook Flange Guard Rail can readily be curved to match the running rail. It is rolled with a depressed flange which throughout its length hooks beneath the main rail, positively preventing the guard rail from rising or overturning. The heavy, rolled-steel two-tie base plates have a shoulder on their upper portions against which the guard rail abutts and which resist side thrust. They are flat where they rest on the ties, so that no adzing is necessary.

The Bethlehem Hook Flange Guard Rail is recommended for use at all locations on main lines, and in yards.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu

BETHLEHEM
HOOK FLANGE GUARD RAIL

A New

POWER TOOL

MODEL 415 is a new Lightweight Power Tool weighing 47½ lbs. which is particularly adaptable for loosening paving and Belgian blocks, for breaking paving and concrete in street railway repair work and demolition work where it is necessary for the operator to hold the machine in a horizontal position, which would be impossible with the heavier machines. Also, it is especially efficient as a heavy power spade in caisson work where the formation is hard and lighter spades are not suitable.

WRITE FOR BULLETIN

GARDNER-DENVER COMPANY
ROCK DRILL DIVISION
DENVER, COLORADO
Sales Offices Throughout the World

GARDNER-DENVER

Now.. Better Right-of-Way Protection

with

NATIONAL

DIRT SET ANCHOR END and CORNER POSTS

Here is one of the most important improvements ever offered in the science of fence construction for right-of-way protection. Fence posts which combine, in the highest degree, these three vital points of excellence—

STRONGER... *Save Time and work*

They afford the maximum rigidity and resistance against time, weather and every kind of strain. Added to their efficiency in wear is the economy of construction. They are simple and easy to install.

Here is method of setting. Bore a 9-inch hole—drop in post—turn post around using brace as a lever. Anchor plates are thus anchored in solid ground at bottom of post hole. You are now ready to stretch your fence. No delay; just a quick, easy and satisfactory job. And when done it is done "for keeps."

From every point of view of long-time protection and economy, first and last, your maintenance department will find it best to specify the Fencing that is internationally known and used.

AMERICAN FENCE

For there is no question of the need for protection of the life and property bordering the right-of-way. To neglect it is to take dangerous chances. Don't wait for a heavy damage suit which would cost more than the efficient safeguard of a good fence.

American Railroad Fence, National End and Corner Posts and Banner Steel Line Posts meet every specification recommended by the American Railway Engineering Association.

EXPANDING ANCHOR

Size when folded 5" by 7⅝"—diagonally 9½".

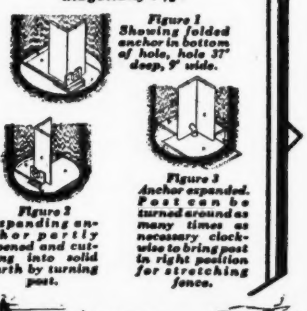
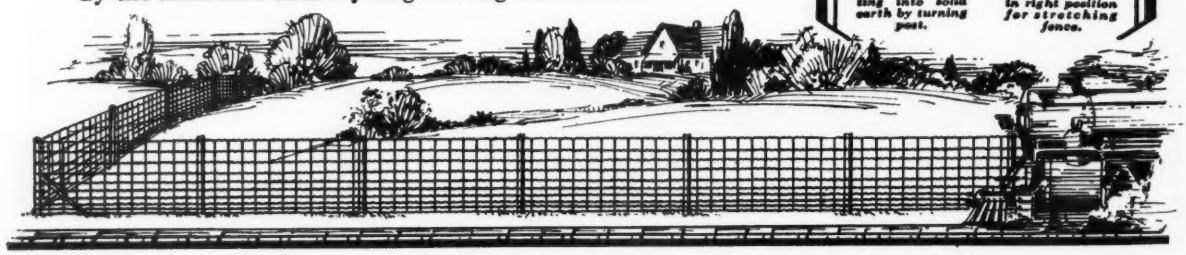


Figure 1 Showing folded anchor in bottom of hole, hole 37" deep, 9" wide.

Figure 2 Expanding anchor partly opened and cutting into solid earth by turning post.

Figure 3 Anchor expanded. Post can be turned around as many times as necessary clockwise to bring post in right position for stretching fence.



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SUBSIDIARY UNITED STATES STEEL CORPORATION

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ELECTRICITY IS THE MODERN POWER

GET MORE DAYS WORK OUT OF YOUR TIE TAMPERS

Tie Tamper Power Plants Will Operate

NUT TIGHTENERS
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PORTABLE DRILLS
" SAWS
" HAMMERS
" GRINDERS
ARC WELDERS
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FLOOD LIGHTS

Start Them Earlier in the Spring
Work Them Later in the Fall

ELECTRICITY
Can Not Freeze

Booths 199 - 200 - 215 - 216 at the Coliseum

Syntron Co., Pittsburgh, Pa.

15 Factory Service Branches

SYNTRON ELECTRIC TIE TAMPERS

Built in 4-6-8-12 Tool Outfits

KREOLITE

Aerial View of Part of the Toledo Plant of The Jennison-Wright Company

Framing of Timbers "BEFORE" Treatment Is Essential

By the installation of the latest and most modern framing and boring machinery, we assure the purchaser of timbers most accurately framed at lowest cost.

The life of treated timber depends upon the character of the preservative used. *We distill our own Creosote oil.* By so doing it is possible for us to insure to the purchaser a uniform pure product of any grade desired.

Enormous stocks of Railroad Cross and Switch Ties, Structural Timbers and Piling, in all sizes, of Solid Oak or Pine, properly sticked and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant, at Granite City, Ill. (East St. Louis).

THE JENNISON-WRIGHT COMPANY, TOLEDO, OHIO

Branches in All Large Cities

R.R. TIES

NOTHING TAKES THE PLACE OF POWER

THAT'S ALWAYS AT YOUR SERVICE

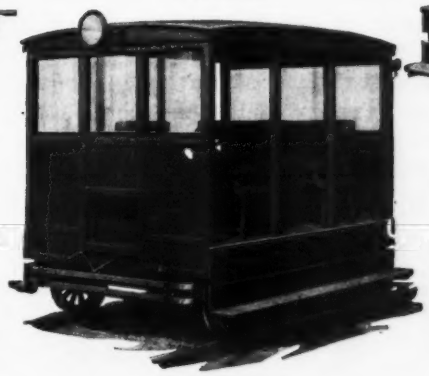
Kalamazoo 25A Motor Car has been especially designed to fill the need for a reliable, powerful car for extra gangs and hump yard service. It can be depended on for continuous operation in this heavy-duty service. Furnished with bodies adapted for every use of general construction gangs or inspection parties.

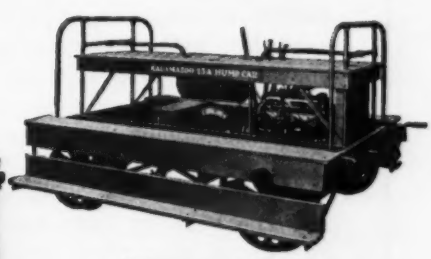
ESTABLISHED 1883

KALAMAZOO MEANS SERVICE TO YOU

Kalamazoo 25A Motor Car with Standard Body that Seats 12 Men.

Kalamazoo 25AC Motor Car with Inspection Body Seating 6 persons.





Kalamazoo 25A Hump Motor Car Equipped with Body Seating 24 Men.

KALAMAZOO RAILWAY SUPPLY CO.

MANUFACTURERS

Kalamazoo, Michigan, U. S. A.

No. 14 of a series

PUBLISHER OF
RAILWAY AGE
RAILWAY MECHANICAL ENGINEER
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ADDRESS REPLY TO
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: SUBSCRIBE FOR YOUR OWN COPY

Dear Reader: January 29, 1930
Everywhere

A few days ago a roadmaster on a prominent railway asked the bridge supervisor with whom he shared offices, if he could borrow the supervisor's copy of the October issue of Railway Engineering and Maintenance. "You can not," the supervisor replied, "for you won't return it. Send Simmons-Boardman $2.00 and get your own copy every month for a year. That's the way I got mine." And this roadmaster sent in his subscription and those of two associates.

I cite this illustration, not primarily to call attention to this particular issue, although we have received requests for more than 8,000 additional copies of a single article in that number, but to emphasize the value to a reader of having his own copy to take with him as he pleases. I have visited offices in which two or more roadmasters or supervisors share one copy. I have even found a few offices where as many as five or six men use a single copy. Experiences of this kind always leave me with a feeling of regret, for I know that these men seldom secure the same help from a community subscription like this as do their fellows who subscribe for their own copies. Either the first man to see it takes it out on the road with him and thereby deprives his associates of it or, if more considerate, leaves it in the office where no one feels able to take the time to read it thoroughly. In either event, the paper is not being read as effectively as is possible.

What is the reason for this situation? Presumably it is economy. Yet the cost is less than twenty cents per month, (12½ cents if taken for two years) or less than the price of a good cigar. No one would think of buying a cigar jointly with an associate. I cannot see why he should deprive himself of the privilege of having his own copy of his business paper to read when and as long as he desires. Do you?

Yours very truly,

ETH*MM

Elmer T. Howson

Editor.

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Laying a Naylor SPIRAL-WELD Toncan Iron Pipe Line for a prominent western railroad.

Lowest Cost Per Foot In The Ground

NAYLOR PIPE costs less per foot in the ground than any other pipe carrying standard weight pressures. No other pipe can be laid as cheaply.

Naylor Pipe is the lightest of all pressure pipe. It weighs only half as much as standard weight wrought pipe.

This light weight is a money saving advantage. It means half the freight to pay; half the weight to haul; half as many men needed for handling in the field; speedier laying. These advantages lower your pipe line costs.

Besides light weight, Naylor Pipe is also made of Toncan Iron for greater resistance to rust and corrosion. Longer life of the pipe means fewer renewals . . . . consequently, lower maintenance costs.

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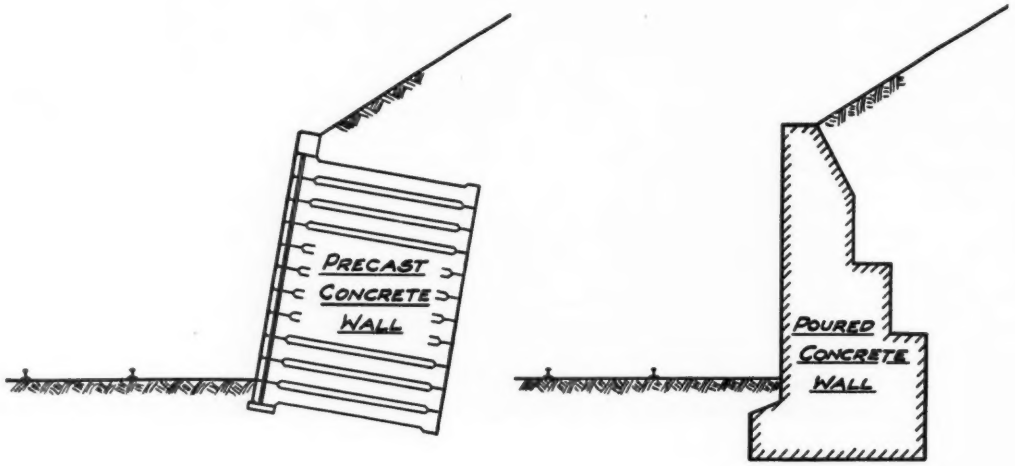

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Railway Engineering and Maintenance

Volume 26 February, 1930 No. 2

Taking a Chance

IT HAS been more than ten years since the railways in the middle west, and particularly those in the vicinity of Chicago, were tied up so completely by snow as they were during the week preceding last Christmas. Suburban schedules were annulled on some roads and service abandoned altogether on others; at least one main terminal was so badly blocked that for a couple of days through passengers were transferred at outlying stations to local trains for movement into the city, while on another road four hours or more was required to bring excess-fare trains the last five or six miles into the station. All this demoralization was brought about by a 14-in. fall of snow. Such a storm was, of course, abnormal. It was not, however, without precedent.

The demoralization of traffic occurred not so much by reason of the severity of the storm as because of failure to take adequate protective measures in time. As a result, switches became choked with snow and important tracks were blocked while the storm was yet young and there was then no opportunity to recover the ground that had been lost. The result was complete demoralization of traffic at a time when the holiday travel was approaching its height. That this result was not unavoidable was evidenced by the fact that some roads were less disorganized than others and were able to maintain train operation with only moderate delays.

It is true that storms of such severity occur only at intervals and that by reason of this fact a road may be warranted in taking a certain amount of chance. On the other hand, the railways have been setting new standards for regularity and reliability of service of late years and have made large expenditures to avoid interruptions by reason of washouts, etc. The more exacting demands of the present day require that similar precautions be taken to combat snow and ice. This is all the more important because these precautions consist principally of the adequate organization of forces and the distribution of simple equipment, without incurring heavy permanent investment. The recent storm constitutes a warning for the roadway department which it should not fail to heed.

A Measure of Service

According to a survey made by George R. Meyercord, formerly president of the Illinois Manufacturers Association, the manufacturers of the United States have made a reduction in their inventories of raw, semi-finished and finished products aggregating $4,879,000,000. If we assume that the annual cost of carrying stocks averages 25 per cent of the investment in them, the saving effected approximates $1,220,000,000 a year.

This reduction has been made possible primarily by the improved service provided by the railways. It is equivalent to a reduction of more than 25 per cent in present freight rates. If to this be added the similar reductions in inventories that have been effected by those engaged in wholesale and retail activities, the total saving becomes much larger. These figures afford a measure of the value to American industry of the improved service provided by the railways in recent years.

Not All Problems Solved

THE American Railway Bridge and Building Association has been in existence for nearly 40 years, while the American Railway Engineering Association has had several committees at work on problems relating to bridges for more than 30 years. Thus, a great deal of time has been devoted to the co-operative study of problems relating to the design, construction and maintenance of railway bridges, and careless thinking might easily lead one to the conclusion that few serious problems in this field remain to be solved. That this is not the case is evidenced by the number of problems in this field which still await a satisfactory solution. Thus, in spite of all that has been said and written, corrosion resulting from brine drippings and exposure to locomotive gases is still as much a matter of concern to the officers of bridge maintenance as it ever was. The making of concrete that will be immune to the effect of sea water in territories of severe winter is still a matter of uncertainty and the efforts to protect wood exposed to marine borers have not been entirely successful.

In spite of efforts to establish standards of design and practice, there are still many points concerning which there is still no unanimity of opinion. To cite a single example—some officers in charge of bridges favor provision for the anchorage of the decks to the structure, while others are equally insistent that no such anchorage should be provided. But, aside from such problems of long standing, are those imposed by changes in physical conditions surrounding railway operation. Heavier equipment and faster schedules introduce new problems relating to various details of design which were previously not

encountered. New materials and new devices must be carefully considered and compared with the materials and equipment in current use.

Social changes have also had their influence. The advent of governmental regulation introduced new problems, while the awakening of a sense of responsibility for personal injuries gave rise to enlarged duties for all men responsible for the work of others. So, in addition to the many vital subjects which have been under consideration by the associations devoted to bridge construction and maintenance, there have constantly been brought forth new subjects which require attention and careful study. There is, therefore, no reason for any anxiety with respect to a dearth of subjects to engage the attention of those enterprising officers of bridges and bridge work who take leadership in association and technical committee work.

Watch for Heaving Track

ONE OF THE best evidences of the improvement that has been made in track maintenance methods in recent years is the fact that less heaving of track has been experienced this winter. It is not many years since a liberal assortment of shims was standard equipment for every section and they were used freely on main as well as branch lines.

With more liberal expenditures for maintenance, one point of trouble after another has been given attention. Adequate installations of drainage have removed much of the moisture from the roadbed and thereby eliminated the heaving and reduced the necessity for remedial measures by the track man. The problem cannot be considered to be solved, however, until all heaving has been eliminated.

Every track foreman and supervisor should note at this season of the year all evidences of heaving on their respective territories and study the problem with sufficient care to enable them to apply proper measures next spring. Now is the time to locate points of trouble and begin preparations for their elimination.

A Study of Camp Cars

AT THIS season of the year, when engineering and maintenance of way officers are ordering materials and developing plans for their spring and summer operations, there is one important detail which frequently does not receive the attention that it deserves. This is the outfitting of camp cars for those employees for whom it is necessary to provide such accommodations. Taking the country as a whole, a vast improvement has been made in the character of housing provided for these men. Yet this improvement is far from universal, and one need not travel far to find conditions that still challenge contention.

The last decade has seen a marked change in the class of labor found in floating gangs. Higher wages, the restriction of immigration, prohibition, the reduction in the drudgery of track work by the installation of machines—all have tended to raise the grade of these forces. Such men appreciate better living accommodations. In fact, they frequently refuse to remain where the standard is low. The more progressive roads have recognized this and are providing better cars. Not infrequently box cars have given way to passenger equipment, which can be more thoroughly insulated against heat and cold and provides more comfortable quarters from other standpoints as well. Numerous roads are installing shower baths and better illumination. They are adding recreation and reading quarters; not infrequently a radio is found in such camps. These facilities cost money—not a large amount, but more than the old frame-bunk, box-car outfit. That they yield a liberal return, however, is no longer open to question. This return is reflected in the form of better labor, reduced turnover and a more satisfied force.

Few maintenance of way officers are unaware of the value of good camp facilities. Many of them hesitate, however, to advocate them with sufficient aggressiveness to bring the desired improvement to pass. It is because of this fact that we are bringing this subject up for discussion at this time, for measures must be initiated now if the camp cars that are to be placed in service in the spring are to be so rebuilt as to attract and hold men. Few measures will do more to promote efficiency in performance next summer than the inauguration of measures now for the modernization of maintenance of way camps. It is, therefore, a subject which roadmasters and division engineers can afford to advocate for their respective territories and proceed to put into effect so far as their authorities permit. It is even more a responsibility of system maintenance of way officers.

Framing Timber Before Treatment

AS ONE studies the progress that the science of wood preservation has made on the railways. he cannot escape the observation that we are rapidly approaching the time when the normal life of crossties will be at least 20 to 25 years. Those roads which pioneered in the treatment of their ties are now achieving this result and others are approaching it as they refine their methods of selecting and handling, as well as treating, their timber and as they equip their ties with plates of adequate dimensions and restrict spiking and other destructive agencies to the minimum. In view of this record, one cannot fail to be struck with the reluctance with which the roads are extending, by the same means, the life of the timber employed for other purposes.

Probably the largest undeveloped opportunity in the maintenance of way field lies in the treatment of timbers for bridge and building work. Here the principal obstacle arises from a necessity for framing much of the timber. It is obvious that little advantage is gained from the treatment if the timber is framed after it is treated, for the protective shell is then mutilated or cut away. Rather it is necessary that the timber be framed before treatment to the minutest detail possible in order that this protection may be unbroken when the stick is placed in the structure. It is because of this necessity that a wide difference of opinion exists regarding the practicability of treating timber for structural uses.

By reason of long practice in the "carpentering" of timber whereby it has been cut at will, many bridge and building men contend that such mutilation cannot be avoided. Fortunately, on a number of roads, such as the Baltimore & Ohio and the Midland Valley, it has been demonstrated by several years' experience that it is not only possible but

practicable to frame timber for structural uses in advance of treatment with such accuracy as to eliminate practically all necessity for subsequent adjustment. Striking evidence of the extent to which it is possible to preframe timber was afforded by a paper presented at the recent convention of the American Wood-Preservers' Association which described the manner in which a highway structure, consisting of two 150-ft. and three 180-ft. Howe truss spans, was fitted with such accuracy that, when the timbers were placed in position in the finished structure, 450 miles from the treating plant, they went together with such accuracy that no alteration was necessary.

Such precision is expected in the erection of steel structures; it is equally practicable with wood. The first essential is a change in the attitude of bridge and building men toward timber. When this change occurs, the railways will be in a position to effect economies in the use of timber for bridge uses approaching those now being realized from the treatment of ties.

Prize Tool Houses or Just Tool Houses?

PRACTICALLY all maintenance of way supervisory officers have come to realize the value of well-kept, orderly section tool houses, but it is interesting to note the varying opinions as to what constitutes a tool house in first-class condition. With reference now only to the interior of tool houses, and, primarily, to their cleanliness and orderliness, it is quite evident that first-prize tool houses on some roads would not be considered "in the running" on other roads.

Not so long ago a supervisor, who had quite a reputation for the favorable condition of the tool houses on his territory and who was willing to concede the interest which he had created among his foremen in this respect, stopped off at one of his tool houses with his immediate superior officer to show him a recently purchased device. In spite of the fact that the device was about three feet long and six inches in diameter, it could not be found, although it was actually in the tool house, as was determined later.

Rather than be delayed by a thorough search, which would have involved moving tools and materials piled in corners and on the roof ties, the two men went on to the next tool house, where another unit of the new equipment was found. Nothing was said to indicate that the tool houses on this territory were in other than the normal condition which had brought commendation to the supervisor.

In contrast with this, an assistant engineer maintenance of way of another road was out on his line and the occasion arose for the use of a measuring tape. As he was near a tool house, his first thought was to look for the common cloth tape with which each section gang was equipped. In less than a minute he returned with the tape, without any apparent inconvenience or delay. When he was through with the borrowed article, he said, "Put it back on the top shelf of the cupboard, over in the left-hand corner." On opening the door of the cupboard, one was confronted with a neatly printed card on the inside of the door with clearly legible letters, covered by isinglass, reading from top to bottom, "Tape, Mason Line, Goggles, Hand Level, Spark Plugs, Flags." There was no question where the tape belonged in this tool house and where it could be found when not in use. Farther down on the inside of the door was a list of the things to be kept on the second shelf of the cupboard, and likewise for each shelf. Only two things were on the open floor in the tool house, two bags of salt, which had been left by the supply train after the foreman had departed in the morning and which he had not yet had an opportunity to place in their proper location. Everything was stored in bins or hung on special racks on the walls, and on each bin and individual unit of the racks was plainly designated the name of the material or tools it was supposed to hold.

The two incidents cited portray the conditions of prize tool houses on two different roads. Neither was dirty, but an inventory in one would have required at least three times as long as in the other. If they were both first-class, the question arises as to why was it difficult to locate a relatively large unit of equipment in one, while a much smaller unit was found with no difficulty in the other. One tool house was in good condition because it was above the average on that particular district or division, while the other was in good condition judged from an entirely different and much higher standard of orderliness.

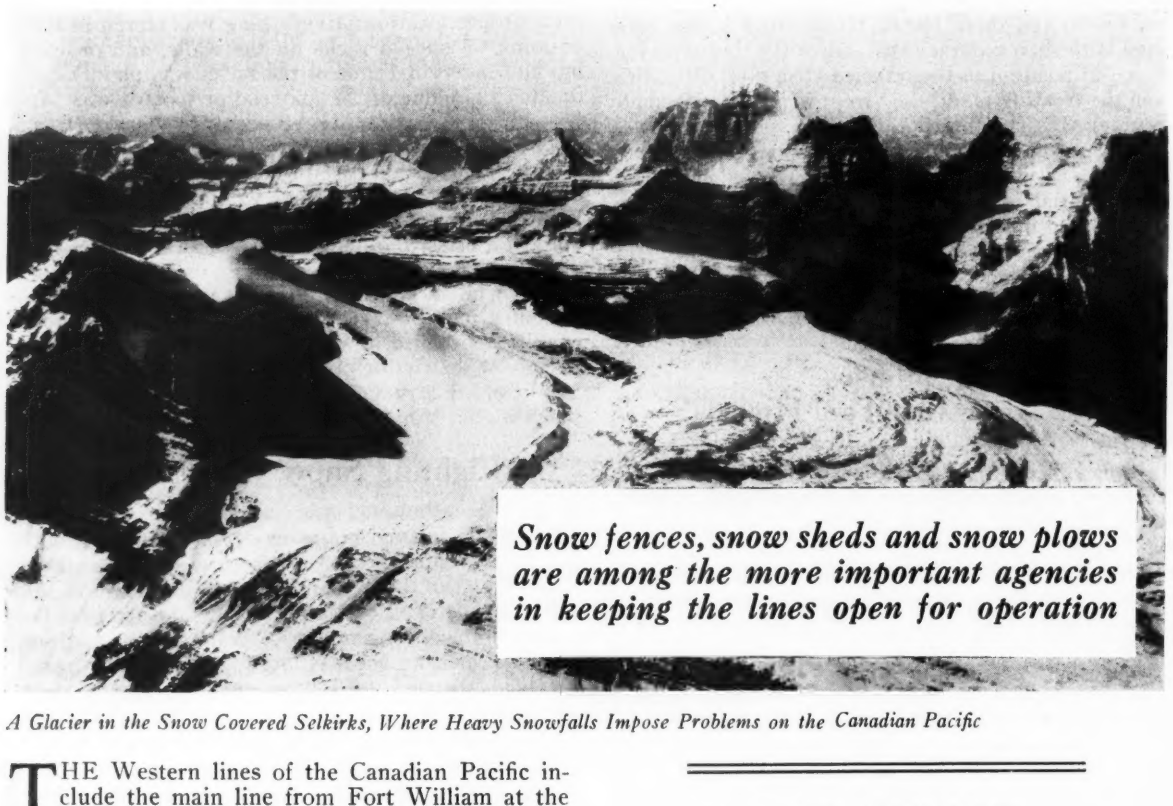
Fighting Snow with Steam

MANY attempts have been made to employ steam for melting snow at yard switches, with but indifferent success. There are several reasons why this is so, the most important of which is drainage. In those sections, where snow and ice give the most trouble, the amount of water which collects from the melting snow is large and, since it is usual for cold weather to follow quickly after a snow storm, ice forms in quantity around the switch, thus creating a situation that is more difficult to handle than the clearing of the snow by hand. Furthermore, the steam condenses rapidly in the exposed pipes, and if adequate provision is not made for disposing of this, the melting equipment will shortly cease to function. Because of this rapid condensation, a comparatively large steam capacity is required, and, if this is not provided, the whole heating system is useless.

On the other hand a number of roads have found it practicable to equip locomotives for blowing the snow out of switches with steam. This is done in two ways. The first scheme is to provide pipes about one inch in diameter, placing them vertically in pairs, on the rear of the tender, so that one pipe is directed to the outside and one to the inside of each rail. The ends of the pipes are bent slightly toward the rail and are flattened to a long narrow aperture, to give as wide a jet as possible and obtain as high a velocity of the steam flow as possible. The other method calls for a cross pipe 2 in. or 3 in. in diameter, in which there are provided a row of ⅛-in. holes, spaced 1 in. to 1½ in. apart. This pipe is placed just back of the forward footboard of a switch engine, which is moved slowly forward over the switch. Both methods have been used successfully, but the second has the advantage that all of the snow in the track is blown away, while the first method cleans only a comparatively narrow strip along the rail. A further advantage of blowing the snow away in this manner, is that a relatively small amount of water is left to freeze around the switch and this can be disposed of effectively by the use of salt.

How the Canadian Pacific Organizes Its Equipment and Men

To Fight Winter Snows*



A Glacier in the Snow Covered Selkirks, Where Heavy Snowfalls Impose Problems on the Canadian Pacific

By F. W. ALEXANDER
Engineer Maintenance of Way, Canadian Pacific, Winnipeg, Man.

THE Western lines of the Canadian Pacific include the main line from Fort William at the head of Lake Superior to Vancouver, B. C., on the Pacific coast, together with all secondary main line and branches within this territory. The total line mileage is 9,596, not including double track, sidings and yards.

The elevation at Fort William is 620 ft. above sea level, and from there west to Winnipeg, a distance of 430 miles, there is little change in elevation. The snowfall amounts to about eight feet per season, but there is little trouble from this source as the country is wooded and there is not much wind. West from Winnipeg, a distance of about 800 miles, to Calgary, which marks roughly the beginning of the mountainous section, the country gradually rises to an elevation of 3,450 ft. This territory is all open prairie subject to high winds and, although the snowfall does not as a rule exceed five feet at any point, the wind piles the snow into drifts that form a serious handicap to railway operation. Temperatures of 30 deg. F. below zero are not uncommon. One hundred and twenty miles west of Calgary the railway crosses the summit of the Rocky mountains at an elevation of 5,330 ft. The snowfall in this region amounts to 12 to 14 ft. per year, temperatures dropping to 40 deg. F. or more below zero.

Continuing west, a descent is made into the valley of the Columbia river, followed by an ascent over the Selkirk range. The summit of this range, 220 miles west of Calgary, is pierced by a double-track tunnel five miles in length. Glacier, situated at the west end of the tunnel, is at an elevation of 3,780 ft. The average snowfall at this point (over a period of 28 years) is 33 ft. per season. The maximum for one month is slightly over 15 ft. The temperature here does not drop as low as in the prairie and mountain sections further east, 30 deg. F. below zero being uncommon.

The mountainous country extends west to within 80 miles of Vancouver, but the snowfall gradually diminishes towards the west, and it may be said that snow trouble ceases beyond a point 75 miles west of the Selkirk summit. This paper covers the measures taken to cope with snow on the wind-swept prairie section and in the region of maximum snowfall through the Selkirks.

Snow Fences Are of Great Value

On the prairies the snowfall would not be of sufficient depth to hamper operations seriously, if it were not gathered up by the wind and deposited on the track. The first care, therefore, is to prevent this by causing the snow to deposit in drifts before it

* Abstracted from a paper presented before the World Engineering Congress, Tokyo, Japan, October 27-November 9, 1929.

reaches that location. To accomplish this, various types of snow fencing are used. The two in common use are built of slabs (eight feet in length), a by-product from lumber or tie mills, although during the past year unedged boards, one inch in thickness, have been used extensively for this purpose. Slabs can be purchased at the mills at the rate of $3.15 a cord, and a cord of slabs will build about 80 lin. ft. of fence. The unedged boards cost $8.85 per M ft. b.m. at the mill, which will build an average of 172 lin. ft. of fence. The labor of handling and erecting the boards is much less than for the slabs, so that board fence costs less per lineal foot than slab fence.

Considerable money was spent in the prairie section in experimenting with the growing of trees for permanent fences, but this experiment met with little success and has been abandoned.

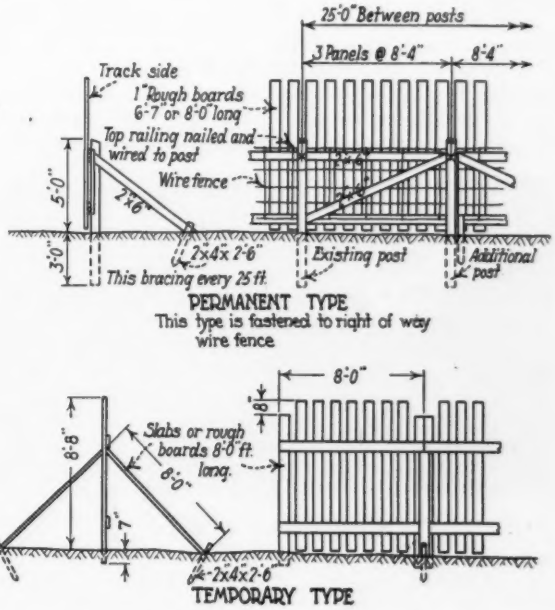
Snow fences should not be erected less than 75 ft. from the track, except where turned in at the end of cuts, or where used as cross fences for the protection of openings that have been left in the main fence for road crossing or other purposes.

Also Employ Temporary Fences

On the older portions of the railway, the right-of-way is too narrow for the erection of permanent fences on railway property, so temporary or portable fences are placed on private land. In very exposed places three lines of fence are necessary to hold all the snow. The Railway Act provides that snow fences may be maintained on private or crown lands from November 1 to April 1. This, however, does not safeguard the railway from paying the owner any damage that can be proved.

On new lines being built, extra land is purchased in the vicinity of all cuts and locations exposed to drifting snow. On the border of this extra land, more or less permanent snow fences are erected as a part of the right-of-way fence. On older sections of the railway, where land is not too expensive, considerable progress has been made in the purchase of extra land for the same purpose. By having sufficient land on which to maintain permanent fences, the yearly cost of erecting and removing temporary structures can be avoided.

There are approximately 626 miles of temporary and 1,180 miles of permanent fences on the Western lines of the Canadian Pacific. Records of the cost of erecting and removing temporary fences show great



Two Common Types of Snow Fencing

variations for different localities, but a fair average would be $160 per mile. Experience, extending over a period of years, dictates the location of fences and the number of lines required in each locality.

Crossing planks are removed from all farm crossings that are not used during winter months to permit of uninterrupted use of snow plows and flangers. The ends of culverts are marked so that they can be readily found and cleared of snow before the spring

A Rotary Cut Through a Snow Slide

run-off. The locations of shims and other materials, piled on right-of-way, are also marked. When storms are long and severe, it is necessary to run plows and flangers and use spreaders in yards. Very little hand work is done, except around switches or in large yards, where it is necessary to load up snow and haul it away.

The plow train is in charge of a conductor. The plow, in the absence of the roadmaster, is in charge of a plow foreman assisted by two men. The plow foreman is a section or extra-gang foreman who has bid in the job on account of the extra pay, and, as a rule, the same men bid in the plows year after year.

A Rotary Plow at Work

On the prairie sections the snow service is of an intermittent character so men are not continuously assigned to it, but are called when required.

In the deep snow section of the Selkirks, the problem is very different. The winter temperatures in this territory are not unduly severe for continuous periods. The mercury may reach as low as 30 deg. F. below zero, but in general subzero weather is of short duration. The snow season may be said to extend from October 15 to April 15, but the months of heaviest average snowfall are December and January. The country is heavily timbered and is not subject to the strong winds which prevail on the prairie sections, so drifting is not a serious problem. The removal of natural snowfall is the most expensive item, while the snowslides cause delay and actual interruption to traffic.

Snow-Plow Operation

The equipment used for the removal of snow from the tracks consists of wing push plows, spreaders, flangers and rotary plows. The latter are used only to remove snowslides or an accumulation of snow which may have collected on some track during the operation of the spreader. The wing plow is used entirely for the clearing of the main track and the removal of small snow slides and drifts. The spreader is used in conjunction with the wing plow to clear sidings and yards.

The usual procedure is as follows: When the natural snowfall has reached a sufficient depth to threaten to impede the free movement of trains, which is generally early in December, the regular snow-service train is put in operation. This is marshalled as follows: Wing plow, spreader, locomotive, flanger and caboose. The flanger also has accommodations for the snow-plow foreman and his men.

The salient features of the wing plow are a movable nose plate which cuts the snow from between the rails and can be adjusted to cut three inches below the top of the rail and in raised position clears the rail by two inches, and two wings which when not in use fit close to the sides of the body of the plow and when in service can be extended at an angle of 45 deg. These wings level off the snow to a height slightly above rail level for a distance of 5½ ft. from each rail. They also throw some of the snow beyond the end of the wing. The proportion of snow thus thrown and the distance it is thrown are dependent on the speed with which the plow is moved along the track. Both the wings and the nose are operated by air and can be held at any distance within the maximum range of their operation.

How the Spreader Is Used

The spreader has now become almost indispensable for handling heavy snowfalls in yards and on sidings and for double-track work. Its main features are a movable nose casting which cuts slightly below rail level when in lowered position and is equipped with teeth for removing ice between the rails, and two wings which when extended reach a distance of 16 ft. from the rail. All movements are air-operated. In sidings and yards consisting of a few tracks, it is usual to spread the snow in one direction. The snow train is first run up the main track, wing plow ahead with nose down and wings extended. All snow dug up by the nose of the plow and thrown out by its wings is collected by the spreader wing and deposited in a ridge well beyond the next track. The train then backs up and repeats the process on each succeeding track until the entire amount of snow thus collected is pushed beyond the outside track.

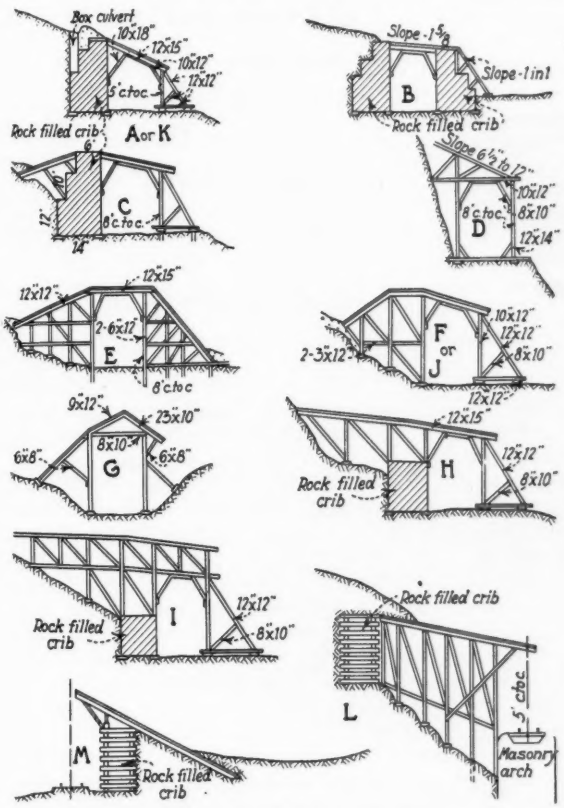
In large terminals, where conditions do not permit such a simple procedure, it is generally necessary to spread the snow from each side to the middle. This means the sacrificing of one, two and sometimes three tracks, unless it is possible to throw it clear with a rotary, or if not, to go to the expense of loading up the snow so collected and hauling it out of the terminal. When spreading tracks in large yards, it is usual to take down the switch stands so as to allow an uninterrupted operation of the spreader wing. It is necessary that all tracks be of approximately the same level in order to operate the spreader satisfactorily.

The Spreader Is a Useful Piece of Equipment in Clearing Snow

The flanger is equipped with four air-operated scoops, which can be lowered sufficiently to clear away the snow just inside the rail and eject it to the side of the track. It is used in conjunction with the plow and the spreader to improve the flangeway in territory of sharp curvature and in places where guard rails prevent the nose of the wing plow being lowered. There are scoops for each direction, which

allow flangeways to be cleared in either direction without turning the flanger. The flanger is also used as a separate unit attached to the rear of freight trains to improve the flangeway in cases of unusual storms in territory not generally affected, and where snow plows are not usually operated.

The work of the snow-service train is performed under the direction of the snow-plow foreman. The



Various Types of Snowsheds

conductor is responsible for its movement on the main track, and the roadmaster, of course, is in general charge of the work. With an experienced foreman and conductor, its operation resolves itself largely into a matter of routine. In periods of continuous heavy snowfall, first attention is given to the main track, the sidings and yard being spread as opportunity offers. As a typical example, between November 15 and November 30, 1927, the plow was operated over the main track 14 times and the sidings were spread six times.

Snowslides generally occur during a period of mild weather following a heavy snow storm. They may vary from 50 to 500 ft. in length and from 5 to 40 ft. in depth, and are sometime accompanied by considerable timber and rock. The smaller slides are cleared by the push plow. If the slide is small enough the plow is run into it at high speed with nose down and wings slightly extended. It is not advisable, however, to enter the slide too far unless there is a good chance of breaking completely through it. Poor judgment in such a case may result in the necessity of digging out the plow and locomotive, with much resultant delay. Some of the larger snow slides are perennial and some are spasmodic. The former have well defined paths down which they travel from the mountain tops to the valleys below. In these cases, snowsheds are built as protective measures and are generally quite effective. Diagrams of the various types of snowsheds are shown in one of the drawings. At the present time only types *D*, *H*, and *I* are being used. For snow slides of less regular habits, or which cover the track at points where the construction of snow sheds would be impracticable or uneconomic, the rotary snow-plow is used.

Employ Rotary Plows

In the territory under discussion there are three rotaries of extra-heavy construction, the design of which is the result of experience with machines of lighter design extending over many years.

The boiler applied to these plows has 2,108 sq. ft. of heating surface and 44 sq. ft. of grate surface. The trucks are of the six-wheel type, specially designed for the purpose, and have cast steel frames. The axles have 7-in. by 12-in. journals, and the steel-tired wheels are 34 in. in diameter.

In working order, these plows weigh 260,000 lb. The weight is practically equal on the two trucks. The tender has a water capacity of 7,000 Imp. gal., and holds 16 tons of coal. The tender trucks are of the four-wheel, equalizer pedestal type, using standard engine-truck wheels and axles.

The cutting knives in these plows are set at a flatter angle than in the older type and, while this slows up progress in clear snow, the flatter angle, together with the heavier construction, has done away with breakages when rocks or trees are encountered in the slides.

How the Rotaries Are Operated

When weather conditions are such as to cause slides, generally any time after January 1, at least one of the rotaries is kept under steam, ready to leave division headquarters at Revelstoke, B. C., on short notice. On advice of a snowslide too large for a wing plow to handle, the rotary is dispatched to the scene. An extra locomotive crew is called to operate the rotary, with as many extra laborers as are thought necessary. On arriving at the slide, it is first decided to which side the snow will be thrown. This is generally determined from the location of the telegraph and signal wires.

The procedure is then as follows: The rotary is pushed up against the slide at a speed of six to eight miles per hour with the wheel revolving at approximately 400 r.p.m. The engineman on the locomotive holds the rotary against the face of the slide until he hears the exhaust of the latter tending to slow up, whereupon he backs out three or four feet and again pushes against the face, repeating this process until signaled to back out of the slide by the foreman in charge or the rotary engineman.

In these intervals the track is carefully examined to see that no rails have been misplaced or broken. The sides of the cut are trimmed off by shovels, mattocks or axes to permit extra clearance. The flangeways are picked out to prevent derailments and, if the face of the slide is higher than the hood of the rotary, it is necessary to break it down. It may also be necessary to remove timbers or rocks which might otherwise damage the blades of the rotary wheel. Careful attention to these last details is essential. If the slides contain a large amount of debris, as is sometimes the case, it may be necessary to use dynamite or stumping powder to dislodge stumps and timbers. A supply of extra tools and carbide lights for illumination at night are carried on each rotary.

A Type of Car that Is Rapidly Becoming Obsolete

What Kind

Four classifications as to use and two as to types of power transmission are differentiated and defined*†

By C. R. KNOWLES ‡

TRACK motor cars are commonly considered as of four general classes: (1) light inspection cars, including both one man and two man cars; (2) section cars, including light section and standard section cars; (3) heavy duty cars, including extra gang, bridge and heavy duty section cars; (4) party inspection cars. There are no sharply defined lines of demarcation between the classes of service which these various types of cars are commonly called upon to perform, and it frequently occurs that one type of car is used for much of the work for which the other types of cars are designed. As a general rule, however, greater economy and more satisfactory results will be obtained if each type of car is used in the particular class of service for which it is designed.

Light Inspection Cars

The first type, or light inspection car, is designed to carry one or two men and tools. This type of car is used extensively by signal maintainers, supervisors and others who are required to travel alone, and for this reason it must be made as light in weight as is consistent with safety. They vary in weight from about 400 lb. to 600 lb., the lighter cars being designed for use by one man.

The earlier types of light inspection cars, which are still used to a considerable extent were what are usually termed side load cars, similar in general construction to a velocipede car, with the deck or frame over two large wheels and with guide arms and axles extending to one and sometimes two guide wheels on the opposite rail, the load being carried principally on the two larger wheels. The first engines used on this type of car were four-cycle engines, direct connected to one of the main wheels, although, as the cars were further developed, two-cycle engines came into use, partly because of reduction of weight, but chiefly for the reason that they were cheaper to build than the four-cycle engine and somewhat simpler in construction and operation. Power was transmitted to the wheels by both chain and gear drive. The majority of the engines used on this type of car were single-cylinder engines, although two-cylinder engines were also used to some extent.

The side load car was very popular on account of its light weight, which ranged from 325 to 375 lb., and the ease with which it could be handled on and off the track. However, it is being replaced rapidly by the center load car because of its greater security against derailment, the load being better distributed and the power being delivered to two wheels instead of one. The center load light inspection car is designed for service in which it is necessary to carry only one or two men and tools. It is similar in construction to the regular section car but much lighter

* The second of a series of 12 or more articles on the Care and Operation of Motor Cars, the first of which appeared in the January issue, page 5.

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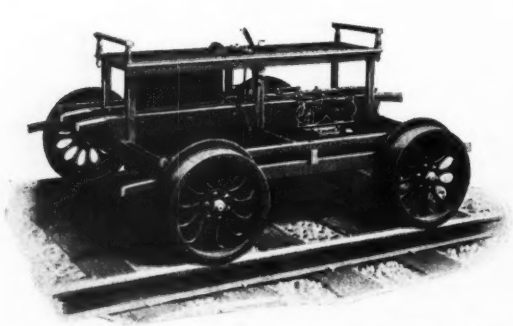
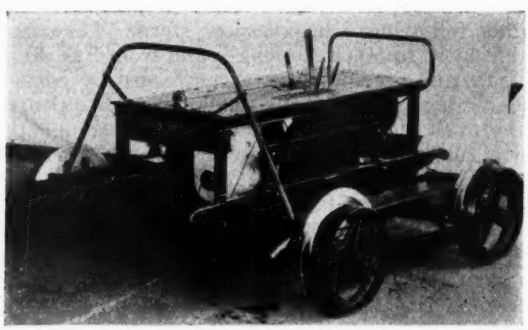
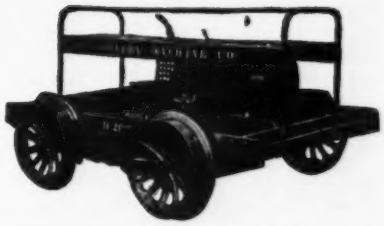
‡ Mr. Knowles is in charge of the operation and maintenance of motor cars and other gasoline operated work equipment on the Illinois Central System.

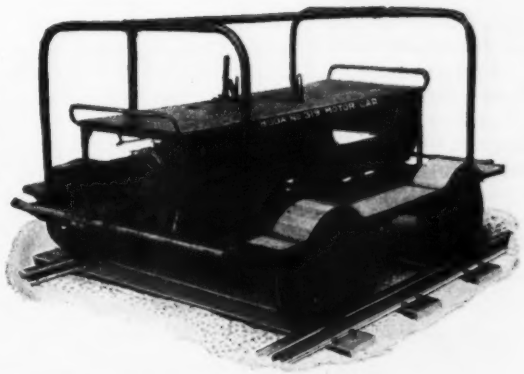




Two Types of Modern Light Inspection Cars

# of a Motor Car?





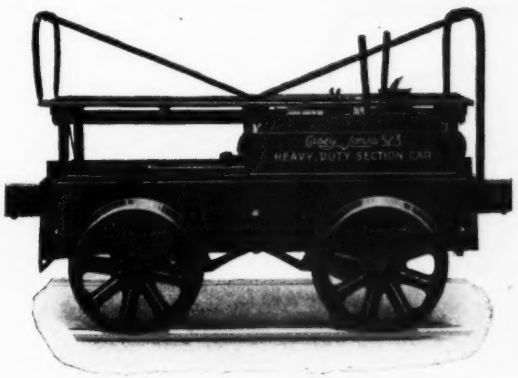
in weight. Both two-cycle and four-cycle engines are used for power on this car, the method of transmission being by means of gears, chains or belts, as well as friction and direct drive.

Section Cars

Track maintenance offers the largest field for motor cars, approximately 70 per cent of all of the cars in service being section cars. It is for this reason that a greater variety of cars have been designed for section use than for any other class of service. The first section motor cars were very largely hand and push cars, upon which small engines were mounted with a belt or chain drive direct to the axle, although the general use of complete motor cars soon followed. While the tendency at first was toward the use of a direct-connected engine, the later trend has been towards a free running engine, to combine the simplicity of the converted cars with the greater stability and power required in section service. Practically all manufacturers have now adopted the free running engine for this service.

Four Types of Standard Section Cars

The general design of the deck is practically the same for all types of section cars, as well as for most of the heavy duty cars. It consists of a raised longitudinal bench seat in the center of the platform or deck over the engine. This seat extends the full length of the platform and provides seating space for from eight to ten men, including the operator of car. The deck on each side of the raised seat, as well as such space beneath as is not taken up by the engine, is utilized for tools and other equipment carried on the car.



While there is little difference in the seating capacity in standard section cars, they vary somewhat in power and weight. The power of the engine in the ordinary section car ranges from 4 to 8 hp. and the weight from 900 to 1,400 lb. This difference in weight is accounted for chiefly by the size of the power plant, the form of drive and the use of wood and steel frames, and to a lesser extent by the wheels, axles and bearings. As a rule, the railroads have used the same size and type of motor car for all sections, regardless of the number of men, as it is desirable to have sufficient reserve power to permit hauling trailers and to take care of temporary increases in the number of men carried. The advantage of uniformity, in both service and maintenance, has also been a factor in promoting the use of one size of car in section service, although there is a tendency of late toward the use of lighter cars on branch lines and at other points where small gangs of four or five men are employed, both on account of the lower cost of a car and for the reason that it can be handled more easily by a small gang.

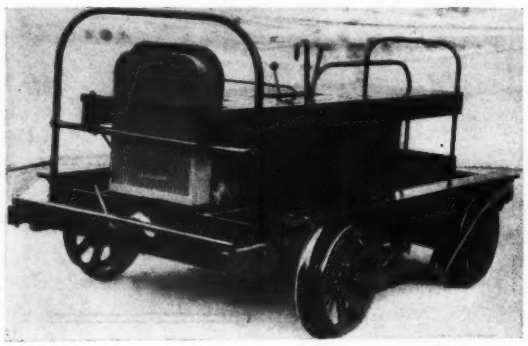
Heavy Duty Cars

Of late years, there has come an increasing demand for heavy duty cars for the transportation of construction and extra gangs, as well as for pulling such labor-saving equipment as mowing machines and ballast discers. The section car is satisfactory for ordinary maintenance work with a gang numbering up to 10 or 12 men and will carry a gang of this size, together with a trailer, over most railroads. Heavier

cars are required, however, where larger gangs are employed and where it is necessary to haul considerable material. It has been found, in many instances, that a heavy duty car will take the place of a work train, performing the work at a much lower cost and with less delay.

The heavy duty cars are similar in design to the section cars, except as to the power plant, and in some cases the length and design of platform and deck. In some designs the deck is made longer to accommodate more men and on others the platform is raised above the wheels and a running board placed outside the wheels to permit of men riding on the platform or lower deck of the car. This latter type of car is also used in hump yards for transporting car riders.

Engines used on heavy duty cars include the four-cylinder automobile type as well as single-cylinder and two-cylinder engines. This type of car not only requires more power but must have greater flexibility in starting and pulling heavy loads as well as varying speeds with uniform power. This has been accomplished by means of disc drives or countershafts with single-cylinder and two-cylinder engines, and with automobile transmission or speed reduction gears on four-cylinder engines.



Three Types of Heavy Duty Cars

Party Inspection Cars

Party inspection cars cover a wide range of sizes and kinds, varying from ordinary section cars to large cars with automobile bodies and engines up to 112 hp. Section and other work cars are used for division inspection service in many instances, the seating arrangement being changed to meet the requirements. Such cars are usually equipped with windshields and with top and side curtains. In some instances the seats are enclosed in a metal or wooden housing, with doors and windows.

Individual Ideas Retard Development

Automobiles have also been converted into party inspection cars by installing special axles and flanged M.C.B. wheels. Many of the party inspection cars in use represent the individual ideas of the railroad upon which they are used, the seats and body of the car being built upon a bare chassis either by railroad forces or by the manufacturer along lines suggested by the purchaser.

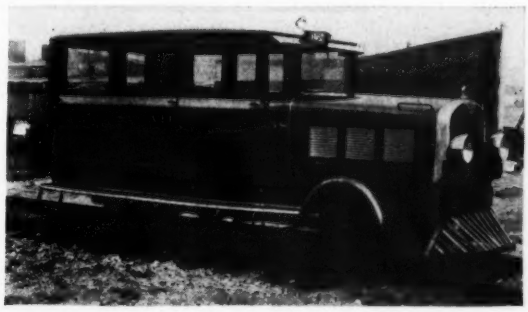
The wide variation in opinions as to how party inspection cars should be constructed has been a factor in preventing the development of uniform cars of this class, as well as increasing their cost. Certain manufacturers of motor cars have developed definite designs, however, which are expected to result in greater uniformity in this class of car and more reasonable cost.

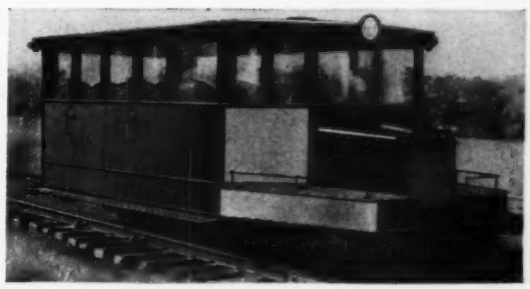
Track motor cars are further classified according to the manner in which the power is transmitted from the engine to the axle and wheels of the car, namely, direct drive and free running. In the former group, the engine is connected direct to the axle and it is necessary to push the car to start the engine, while in the latter group the engine can be operated

while the car is standing and power can be applied to the wheels of the car at the will of the operator. Each classification, however, includes a number of variations in the manner in which the power is transmitted, thus enabling maintenance officers to select the types which best suit their needs.

The Direct Drive

One of the simplest forms of drive is that in which the axle of the car forms the crankshaft of the engine. This drive has been used extensively on light inspection cars with one and two cylinders and also on section cars with two and three cylinders. While this type of drive has the advantage of simplicity, as the engine is connected direct to the axle and no chains, gears or belts are required, it also has the disadvantage that the car must be pushed to start the engine and it is not capable of producing any appreciable amount of power until considerable speed is attained.





Two Types of Modern Party Inspection Cars

Chain and Sprocket Drive

Another type of direct drive is that in which the engine is geared direct to the axle by means of a chain and sprockets. This has the advantage over the design just mentioned in that it is possible, by increasing the size of the gear or sprocket on the axle, to speed up the engine and obtain more power when starting the load. It has the same disadvantage, however, that the car must be pushed to start the engine.

The chain drive is also used extensively with free-running engines, the application of the power being controlled by means of friction discs or clutches. In this design, the friction disc is mounted directly on the crank shaft of the engine, while the friction drive wheel is mounted on a spline shaft and can be moved across the face of the disc to increase or decrease the speed of the car without changing the speed of the engine. By shifting the friction drive wheel to the opposite side of the disc, the direction of the car may be reversed. The pulling power of the engine can also be utilized in proportion to the load, or, by releasing the friction, the car may be stopped without shutting down the engine. This is the most flexible motor car drive with the exception of the automobile type of transmission. It is expensive in first cost and requires care and skill to insure economical operation. Different forms of clutches have been used in connection with chain drive with varying success. Where a durable clutch is used, this is a very satisfactory form of drive.

The belt drive is the oldest and at the same time probably the most widely used form of motor car drive. In the earlier types of belt drives, the belt was tightened by means of an idler pulley, allowing the engine to run while the car was standing. In others the belt was in constant tension and the engine could be run only when the car was in motion or the belt removed from the pulleys. More recently the belt drive has been improved by placing the engine on a sliding base so that, by moving the engine forward by means of a lever, it will run idle while by reversing the movement the belt will be placed in tension and power transmitted to the wheels. Idler pulleys are still used to some extent on belt-driven cars and it is possible that they may again come into more general use with improvements in the designs of the idlers.

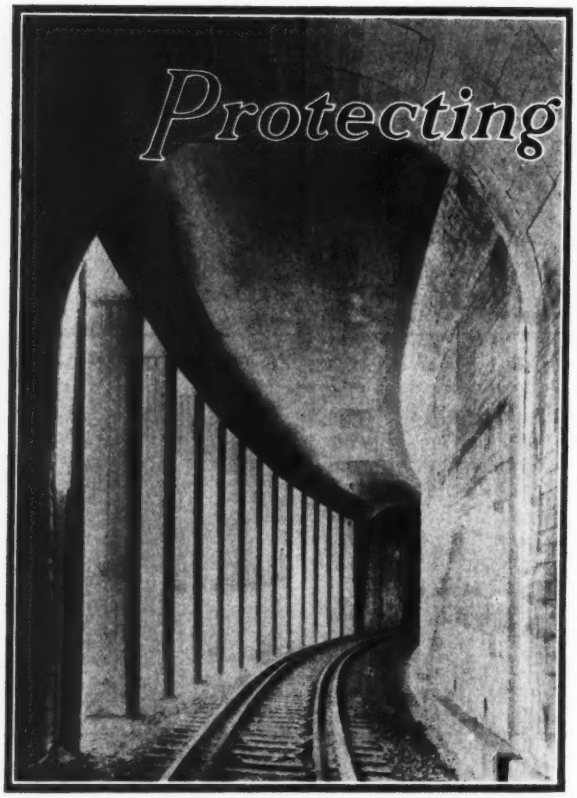
A more recent application of the belt drive comprises what is known as the two-speed transmission, consisting of a combination belt and chain or gear drive in which a belt transmits the power from the engine to a countershaft located directly over the rear axle, to which power is transmitted by chains and sprocket, or gears. By shifting the gears or employing the alternate sprocket, two speeds may be obtained, a high speed when the movement of the car only is desired, or a low speed when additional power is required. The latter feature is particularly desirable when heavy loads such as heavily loaded trailer cars, mowing machines, disc weeders, etc., are to be pulled.

Free-Running Type Favored

It is generally conceded that the free-running type of drive is more desirable than the direct drive, particularly for section and heavy duty cars, not only from the standpoint of safety but also by reason of the advantage that this form of drive possesses in starting heavy loads.

The size of engine and the power required for various classes of service, such as light inspection, section and heavy duty cars varies with the method of transmission and drive, the gradients encountered and the reserve power required for pulling trailers. For example, a six-horsepower engine equipped with a two-speed transmission will have more power at low speed than an eight-horsepower direct-connected engine or one with a single-speed transmission as usually designed.

As a general rule, light inspection cars are equipped with engines of 4 and 6 hp., section cars with 6 to 8 hp., and heavy duty cars with 8 to 30 hp.



Interior of Mud Shed Between Tunnels 10 and 11

Protecting the Tracks *from* Mud Slides

Mud sheds on the Cascade line of the Southern Pacific also afford a barrier to falling rocks and snow slides

BETWEEN Black Butte, Cal., and Eugene, Ore., the Shasta division of the Southern Pacific includes two widely divergent lines, both of which pass through rugged mountainous country. On both of these lines, high rocky slopes are encountered, and at several points it is necessary to protect the main tracks against sliding material and against rocks and boulders that become loosened as a result of alternate freezing and thawing.

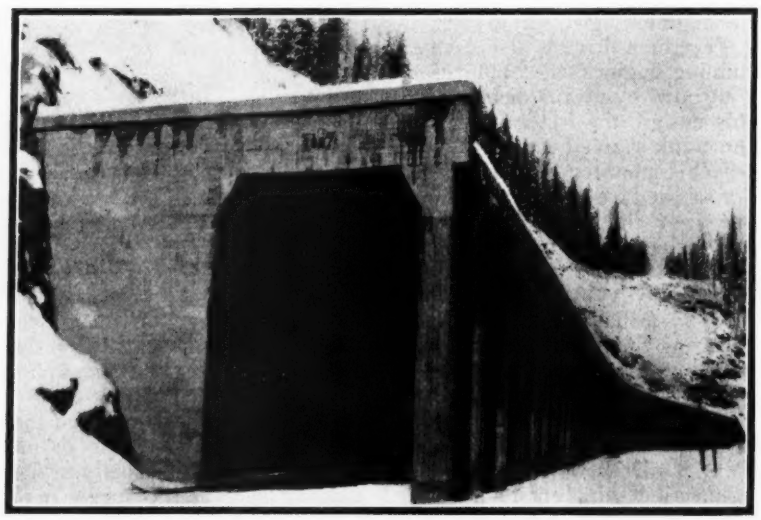
One of these alternate routes passes through the Siskiyou range near the California-Oregon line, north of which it follows the valley between the Coast range and the Cascades. The other line lies east of the Cascades for most of its length, crossing the summit of these mountains at Odell Lake, Ore., whence it drops down the western side of the range to a junction with the Siskiyou line at Eugene. In the Cascades, and particularly on the western slope of these mountains, the railway passes through a region of heavy snowfall, so that snowslides occur at certain places.

The construction of a timber shed, capable of sustaining the load produced by mud slides and also of withstanding the impact of heavy rocks and of carrying them across the main track when they become dislodged from the slope above, has afforded adequate protection at Tunnel 9 for many years, the only place on the Siskiyou line where rock slides have bothered. Owing to the undue amount of maintenance which this type of construction required, however, and the fire risk which it involved, it has been replaced with a concrete "mud shed."

At a number of places on the Cascade line, however, the steep slopes immediately adjacent to the track rise to heights of 200 ft. or more, and mud and rock slides occur frequently. At several of these places the conditions are also favorable for the occurrence of snow slides. As a result, the sheds which have been erected serve the double purpose of protecting against both mud and snow slides and falling rocks.

Here, as on the Siskiyou line, concrete has been selected as the most desirable material for the construction of these sheds, in order to reduce maintenance and eliminate the fire risk. This latter item is of more than ordinary importance on the Cascade line, since, in the section where the mud sheds are required, the railway passes through the Cascade national forest, which is heavily timbered with Douglas fir, so that a fire might have disastrous consequences.

This section of the country shows evidence of vio-



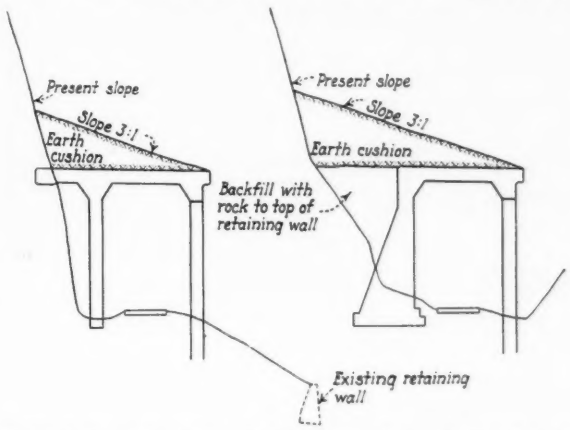
Exterior of Mud Shed at West End of Tunnel 5, Cascade Line

lent volcanic activity in the remote past, most of the surface being covered to a considerable depth with volcanic ashes and pumice. Wherever practical, the foundations of the sheds are, therefore, carried to solid rock; where this is not feasible, spread footings are employed, which rest on the pumice or on the underlying clay.

Types of Construction

Two types of construction have been followed to meet the conditions which are encountered. Where the slope is far enough away to permit, or if it consists of loose material, a gravity section retaining wall is constructed on the uphill side of the track to act as a buttress against the pressure of the sliding material. In this type, the reinforced slab which provides the roof of the shed is constructed as an integral part of the retaining wall, no joint being provided between the slab and its support. The reinforcing rods in the slab extend into the gravity section in such a manner and to such a depth as to insure complete anchorage and that the two members will act together under load or impact.

Where the track passes through a rock cut, there is seldom sufficient room or the need for a gravity section. In such cases, the roof slab is supported partly on a seat cut into the rock wall and partly by



Typical Cross-Sections, Showing Gravity and Reinforced Walls

a thin reinforced wall which is constructed between the track and the rock face. In this type, the bond between the roof slab and the reinforced wall is obtained in the same manner as with the gravity section.

In both types of construction, the slab is supported at the front, or down-hill side of the track, on reinforced concrete columns, 2 ft. 6 in. by 3 ft. in section, spaced on 12 ft. centers. The vertical reinforcing rods in the columns and the diagonal rods, which are introduced into the heavy fillets between the beam and slab, are continuous between the columns and the slab, so that these members are tied together rigidly through the beam, which supports the slab between columns.

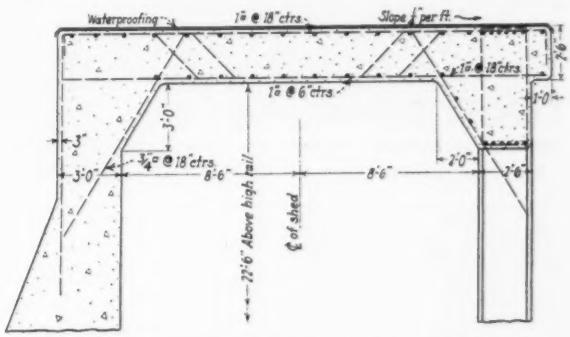
In both types of construction, expansion joints are introduced at every fourth panel, and portals are constructed at the open ends of the sheds, similar in appearance to the portal walls at the ends of the tunnels on the line.

In some cases, the mud sheds are built immediately adjacent to and form an extension of a tunnel. Where this occurs, a wide opening or chimney, 3 ft. by 13 ft.

Close-Up Showing Portal and Columns

with curb walls 5 ft. high, is provided in the roof slab to aid in the quick disposal of the smoke and hot gases which accumulate in the tunnel during the passage of trains.

The space in the rear of the gravity retaining wall is back-filled with rock, the inertia of which assists in absorbing the shock of rock or mud slides. In both types, the roof slab is waterproofed with a



Typical Section, Showing Details of Design

three-ply membrane waterproofing. While the final mopping is still hot, it is covered with ½ in. of sand. The entire shed is then covered with an earth cushion, which rises on a slope of 3:1, from the front edge of the roof to a junction with the hill, to break the impact and prevent injury to the structure from falling stones. Both the gravity and the reinforced walls are provided with weep holes, spaced 12 ft. apart, at the track level, which are formed by placing 8-in. vitrified pipe through the wall.

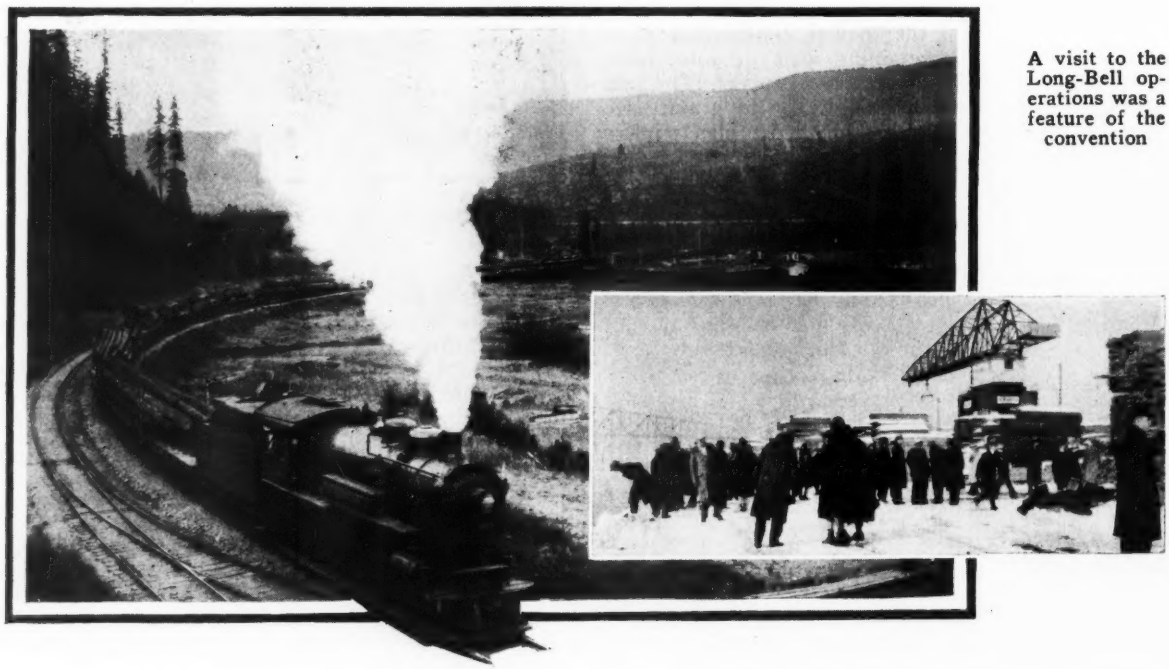
Up to the present, these structures have been installed on the Shasta division as follows:

	Lin. Ft.
Siskiyou line, Tunnel 9	159
Cascade line, Tunnel 5	831
Between Tunnels 10 and 11	163
Tunnel 12	675

The plans for these structures were prepared and the work was carried out under the direction of W. H. Kirkbride, engineer maintenance of way and structures.

Can Timber Be Protected Against Decay?

Data presented at Wood Preservers' Convention show marked progress in increasing life of wood



A visit to the Long-Bell operations was a feature of the convention

ALTHOUGH the railways are now the largest users of treated timber, papers that were presented at the twenty-sixth annual convention of the American Wood-Preservers' Association, which was held at Seattle, January 27-29, inclusive, indicate that they are constantly extending the use of this material. F. D. Mattos, manager treating plants, Southern Pacific, told of the uses of creosoted Douglas fir on the Pacific lines of his road, and R. J. Middleton, assistant chief engineer, Chicago, Milwaukee, St. Paul & Pacific, discussed the use of creosoted Douglas fir piles and timber in docks and bridges by that system. J. D. MacLean, senior engineer, Forest Products Laboratory, Madison, Wis., read a paper on The Preservative Treatment of Engelmann Spruce Ties, and L. C. Drefahl, Grasselli Chemical Company, Cleveland, Ohio, discussed zinc chloride as a wood preservative. Three papers were presented on different phases of the termite problem, while other papers dealt with the more technical matters relating to the handling, seasoning and treatment of timbers, and improvements in treating methods and plant operation.

Committee reports were presented on such subjects as the Treatment of Car Lumber, the Treatment of Fir Lumber, the Determination of the Strength of Douglas Fir with Relation to Moisture Content, Tie Service Records, Posts, the Non-Pressure Treatment of Poles, Pole Service Records and Preservatives.

Approximately 100 persons en route to the convention left Chicago Thursday morning, January 23, on a special train provided by the Chicago, Burlington & Quincy and the Union Pacific, stopping en route to visit the treating plants of the Burlington at Galesburg, Ill., and of the Union Pacific at Laramie, Wyo., Pocatello, Idaho, and The Dalles, Ore. A further stop was made at Longview, Wash., on January 27 to visit the mills of the Long-Bell and the Weyerhaueser lumber companies, where opportunity was afforded to observe the handling and sawing of Douglas fir and western hemlock timber.

As in past years, the attendance was composed largely of railway men, including both those engaged in the operation of railroad-owned plants and those responsible for the use of ties and other materials treated at commercial plants. Approximately 23 per cent of the membership of the association is comprised of railway officers, while the roads consume more than three-quarters of all of the timber treated. All sessions of the convention were presided over by H. E. Horrocks, manager, West Coast Wood Preserving Company, Seattle, Wash.

In reviewing the work of the association during the last year, President Horrocks took occasion to

emphasize the responsibility of the organization for the perfection of standards for handling and treating timber. "It is our responsibility," he said, "to establish accurate workable standards and specifications. Records of performance are required and we must continue to supply them. We must be open-minded to new or improved preservatives and methods of treatment but we cannot endorse such innovations until they have passed the acid test of technical, practical and service proof." Continuing, Mr. Horrocks said: "Our association must be as careful in fostering and promoting the proper grade of material to be given preservative treatment as in protecting the user in the correct preservative treatment for the purpose intended."

At the closing session on Thursday morning, the following officers were elected for the ensuing year: President, C. C. Cook, maintenance engineer, Baltimore & Ohio, Baltimore, Md.; first vice-president, John Penney, vice-president, T. J. Moss Tie Company, St. Louis, Mo.; second vice-president, Elmer T. Howson, editor, *Railway Engineering and Maintenance*, Chicago; secretary-treasurer, H. R. Dawson; members executive committee, Robert H. Moore, general manager, American Creosoting Company, Louisville, Ky; Frank D. Mattos, manager treating plants, Southern Pacific, West Oakland, Cal. Philadelphia was selected as the location for the next convention.

Creosoted Douglas Fir in Docks

R. J. MIDDLETON, assistant chief engineer, Chicago, Milwaukee, St. Paul & Pacific, outlined the difficulties that are experienced with wooden structures in the waters of Puget Sound, where the uniform salinity and nearly uniform temperature of the water, the wide range of tidal elevations and the presence of shore currents are favorable to the propagation, distribution and sustenance of toredos and *Limnoria*. His paper follows in abstract:

Our inspectors have observed *Bankia* borings and *Limnoria* erosions at all of our water front structures; the former working mostly between mud line and mean low tide level, while the latter makes its attack above low water. We have found it impossible to forecast, even approximately, the life of untreated piling or timber in these waters. In some extreme cases, of which we have record, the life has been quite short. In one instance the *Bankia* destroyed untreated piling in six to eight months, and in another instance, at a different locality, the *Limnoria* worked equally fast.

Our experience indicates that creosoted timber better resists the attack of the *Limnoria* than of the *Bankia*, as the work of the former has been confined largely to untreated timber, or to treated timber where the creosote shell has been broken either by driftwood chafing, by *Bankia* borings, or inadequate field creosoting of bolt holes.

During 1909 the Milwaukee railroad constructed two docks on its water front at Tacoma, Wash., using creosoted Douglas fir piling. In that year approximately 1,100 creosoted supporting piles and 68 untreated bark-stuck fender piles were driven for the first unit of Dock No. 1. Untreated bark-stuck fender piles were used because it was thought that the mechanical wear and breakage caused by steamships berthing along the dock would be so great as to make treated piles uneconomical. However, the mechanical wear was less and the activities of marine borers were greater than was anticipated; hence, when the fender piles required replacement, creosoted piles were used.

Low tide inspections and pulling tests were made annually, and by 1919, or ten years after construction, approximately 50 per cent of the piling were found to be badly infested by the marine borers. At the end of 1922, we had completed the redriving of the original portion of Dock No. 1, constructed in 1909. Notwithstanding the fact that the creosoted piling under the first unit of this dock gave somewhat less life than expected, they did prove an economy in comparison with untreated piles.

During 1912, Dock No. 1 was extended to approximately twice its original length, and 946 treated piles were driven. The 1928 inspection disclosed 56, or 6 per cent, of the piles infested, but none have as yet been redriven.

Early in 1909, 737 creosoted supporting piles and 71 untreated bark-stuck piles were driven for a warehouse and grain elevator, known as Dock No. 3. As with Dock No. 1, these untreated fender piles gave very short life and were soon redriven with creosoted piling, making a total of 808 creosoted piles in this structure. In 1922 the inspection showed 176 piling infested out of the original 808 that had been redriven by the close of the year. A careful diver inspection, made in 1927, showed about 80 piles, or 10 per cent, infested with marine borers, and they were redriven. Ten per cent were estimated to be good for at least five years and the remainder appeared entirely sound.

During 1917 our company constructed another dock in the vicinity of Dock No. 1, and of approximately the same size, known as Dock No. 2. This structure required 2,550 creosoted piles. The specifications followed in the treatment of these piling required 12 lb. of preservative to be used. Piling in this dock are very large and apparently well treated, and we have to this date found only one infested pile.

Near the foot of Lander Street, Seattle, our company, in 1908, drove 1,054 creosoted piles for Milwaukee Ocean Dock. In 1927, a diver inspection was made and 1,036 piles were examined, with the following results: 17.3 per cent bad, 10.9 per cent good but slightly infested, 71.8 per cent sound. In 1927 general repairs were made to the Ocean Dock and these badly infested piles were redriven. The dock was extended and 1,330 piles were used. All these piles were creosoted in accordance with our latest specification.

From the foregoing it will be noted that we have in one of our docks few, if any, of the piles driven 20 years ago, while in another fully 70 per cent remain, and in another 78 per cent are still in use. Also, the outer end of one has fully 96 per cent in place after 16 years' use, and another has 100 per cent after 12 years' service.

In the use of creosoted piling and creosoted timber in dock construction there is a matter of fire hazard which gives dock owners no little concern. A few years ago a dock in Seattle, supported on creosoted piles, was destroyed by fire, which apparently originated beneath the dock and, because of the rapidity of action, the fire was soon out of control. A similar fire occurred in Seattle in July, 1929. The latter structure was supported on creosoted piles with creosoted caps and stringers. The fire apparently originated underneath the floor at the outer end of the dock, and in an amazingly short time it traveled underneath the floor the entire length and breadth of the building, charring the caps, stringers, the under side of the floor, and the piling down to the water line, and burning holes through transverse draft curtains, about 100 ft. apart, under the dock. The interior of the structure was preserved by a sprinkler system, but it was very difficult to fight the fire where it attacked the unprotected portions outside of the warehouse, because of the intense heat and dense smoke of the burning gases generated.

Treated Douglas Fir on the Southern Pacific

THE Southern Pacific has long used Douglas fir for a wide variety of purposes. This road is also a pioneer in the treatment of this wood with preservatives, for use in tracks, bridges and docks. It now operates four treating plants. The experiences of this road with the treatment of Douglas fir were described by F. D. Mattos, manager treating plants, Southern Pacific Company, West Oakland, Cal., from which the following is abstracted:

The Southern Pacific Company's wood preserving activities started when a creosoting plant for the treatment of Douglas fir piling was put in operation at San Pedro, Cal., early in 1889. Piling was the principal product, and a considerable quantity was treated; some timber was also treated. Treatment was by the Bethel process. The piling treated at this plant was used in the construction of the Oakland Broadway ferry slip in 1889, the Oakland Long Wharf in 1890, and the Santa Monica Long Wharf in 1892. When the Oakland Long Wharf was dismantled in 1919, many of the piles driven in 1890 were still in perfect condition. The Santa Monica Long wharf was dismantled in 1916, and a large percentage of the piles salvaged

from that structure were redriven elsewhere, many of which are still in service. Early in 1890, the San Pedro plant was partially destroyed by fire. The salvaged equipment was removed to Oakland and set up for creosoting piling and lumber and for the treatment of ties with zinc chloride. From 1917 until 1924, lumber used in inland construction was also treated with a mixture of two-thirds creosote and one-third fuel oil.

In 1893 a portable treating plant was also put in service. This plant, known as the Latham plant, was used at various points from Oakland north, principally for the treatment of ties with zinc chloride. In 1906 another portable plant was put in service at Los Angeles, Cal., also principally for the treating of ties with zinc chloride. In 1922 the Los Angeles plant was moved to Wilmington, Cal., and two 6-ft. by 132-ft. retorts added. Ties were treated with straight creosote at Wilmington until 1924, at which time treatment with a creosote and fuel oil mixture was started. In 1924, the Southern Pacific acquired the plant of the El Paso & Southwestern at Alamogordo, New Mexico, through merger. This plant has two 6-ft. by 106-ft. retorts, built in 1902.

In September, 1925, a new plant was put in service at Oakland. The following year the Latham portable plant was dismantled and a new plant was put in service at Eugene, Ore.

The abandonment of the Latham plant marked the end of zinc chloride treatment. Present practice is to treat ties and lumber for inland construction with a mixture of 70 per cent creosote and 30 per cent fuel oil by weight. Lumber for marine structures and all piling are treated with straight creosote.

The principal output of these plants is cross ties. The average number treated annually for the past three years has been 2,750,000 ties. These were all treated by the Rueping process with a final retention ranging from 7 to 7½ lb. of the mixture per cubic foot. About ten million feet, board measure, of lumber and piling are treated annually. The lumber is treated to practical refusal with the same mixture as used for ties. All piling is treated with straight creosote, with a retention of 12 to 15 lb. per cubic foot.

At present about 85 per cent of the ties used annually are treated. Some untreated cedar and redwood ties are used, and a few untreated Douglas fir ties are placed on sharp curves where mechanical wear is so rapid that the ties have no chance to decay before they are destroyed. Of the 34,000,000 ties which were in track at the beginning of 1929, 34 per cent were treated with either straight creosote or mixture, 31 per cent were treated with zinc chloride, and the remainder were untreated. At that time, only 16 per cent of the switch and bridge ties in track were treated, but these are now being treated before installation. The various wooden bridges, trestles and marine structures on our lines, which aggregate 140 lineal miles of line, contain approximately 400,000,000 ft., board measure, of Douglas fir timber, of which about 40 per cent is treated. This percentage will increase as the replacement of untreated structures becomes necessary. These 140 miles of timber bridges represent 95 per cent of the total of all bridges which we have in service. The other 5 per cent consist of combination steel and timber bridges and bridges of other materials. There are also about 275,000 pieces of piling supporting inland structures, of which approximately 75 per cent are creosoted Douglas fir. In marine structures there are in the neighborhood of 60,000 pieces of Douglas fir piling, all treated.

We have many bridges in which creosoted Douglas fir piles and stringers have lasted more than 30 years and are still in excellent condition. One such structure, built in 1900, still has all the original stringers and piling, although two additional piles per bent were added in 1923. Another structure has been in a branch line in Southern California since 1896 without requiring any work. Such repairs as have been made on these structures have been minor and have consisted principally of the replacement of caps because of crushing, and the renewal of a few piles that were split in driving. Since the life of untreated Douglas fir stringers ranges from 8 to 15 years, the desirability of using treated material is evident.

Cross ties are no longer removed from Southern Pacific tracks on account of decay. When we were using considerable numbers of untreated Douglas fir ties we found that their average life on the Pacific lines was 6 years. Treatment with zinc chloride resulted in a life of 11 to 12 years. Our experience with oil-treated ties is not yet extensive enough to give us exact figures on their life, but the data now available indicate 21 to 22 years. The deep and uniform penetration of creosote-fuel oil mixtures in incised Douglas fir ties appears to be adequate to prevent decay for much more than this period. Rail cutting, splitting, checking, and in the case of ties on curves, crushing under the lower rail, are the factors which determine the life of the mixture-treated ties. We are continually experimenting with devices to reduce these factors. For a number of years we have been using flat bottom tie plates of our own design in place of the ribbed tie plates used in former years, which did so much damage to ties. On curves where greatest wear occurs, we are experimenting with a gage plate which is fastened to the tie under the tie plate. The ties are bored and adzed for the plate before treatment, and the plate is fastened by a bolt through the tie, located far enough from the rail bearing to avoid weakening the tie.

Report on Tie Service Records

THE Committee on Tie Service Records, of which W. R. Goodwin, engineer of wood preservation, Minneapolis, St. Paul & Sault Ste. Marie, was chairman, presented a table showing the tie renewals per mile for 1928 on 26 railways having a total mileage of 208,308. It is of particular interest that again in 1928, 21 roads reported that 90 per cent or more of the ties used for renewals were treated, while 8 of these roads did not use any untreated ties and 2 of the latter have not done so for the past 4 years. Fourteen roads show that 80 per cent or more of all ties in the track are treated; and of these roads, 7, or half, report that less than 10 per cent of the ties in use are untreated; while 1 road has no untreated ties in service. It is of further interest that on 17 roads the renewals were less than 165 ties per mile; the 7 roads, upon which 90 per cent or more of the ties in service are treated, used an average of 120 ties per mile in 1928 for renewals; while those roads with less than 80 per cent of treated ties in service, averaged 201 ties per mile.

The number of tie renewals made per mile of track maintained in 1928 and the average number of renewals made annually during the five years ending with 1928 are shown in the table for the 26 roads reporting:

Tie Service Records

Road—	1928 Renewals	5-Year Average
A. T. & S. F.	156	125
B. & O.	164	185
C. & O.	222	270
C. B. & Q.	164	154
C. & E. I.	122	107
C. C. C. & St. L.	100	117
C. I. & L.	120	129
C. M. St. P. & P.	284	233
C. R. I. & P.	148	140
D. L. & W.	91	93
G. N.	226	207
I. C.	262	180
K. C. S.	147	155
L. V.	56	86
M. C.	108	157
M-K-T	219	228
M. P.	248	287
M. St. P. & S. Ste. M.	270	298
N. Y. C. (East)	141	164
N. Y. C. (West)	89	102
N. P.	151	155
Penna.	150	181
Reading	138	172
S. P. (Atlantic System)	221	236
S. P. (Pacific System)	195	220
U. P.	177	199

The committee also discussed the importance of eliminating unnecessary abuse to ties in handling after treatment, in part as follows:

A very careful job of treatment may be completely ruined by improper handling of treated material. Nearly every road has its own rules covering the handling of treated material, but few roads conduct regular "follow up" inspections, except as made by the usual supervisory forces.

Much of the damage to treated material occurs through rough handling as it is distributed for use. Crossties are particularly subjected to rough treatment during unloading. Generally ties are unloaded by hand and unless extreme care is exercised they are often thrown on top of each other, or on rocks, rails, or

Ties Have Always Formed the Great Bulk of the Timber Subjected to Treatment

other objects, with the result that some are badly bruised, exposing untreated wood; occasionally softwood ties are broken.

Bridge timber and piling are also considerably abused in unloading at the point of use. The old method of cutting the stakes and letting the timbers roll from flat cars is still employed on some roads. This is very bad practice from the standpoint of scarring and breaking the timber. The handling of such material can be done most profitably with such mechanical devices as a locomotive crane or by having the pile-driving crane so constructed that it can be used for this purpose.

A representative amount of old treated bridge timber and piling should be examined carefully when removed from service to determine the cause of failure. Often the cause of failure can be traced back to abuse of the material at the time of construction. Much information leading to improved methods of handling and the care of treated wood can be developed from such inspections if properly and regularly performed. The committee is of the opinion that "follow-up inspections" can be made best by representatives of the treating department, working jointly with the proper officers of the engineering department.

The committee then reprinted with its approval recommendations presented by the committee on Wood Preservation of the A.R.E.A. in 1927, outlining precautions to be taken in the handling of timber after treatment. (See March Daily Edition, *Railway Age-Railway Engineering and Maintenance* for March 11, 1927, page 872.

Treating Engelmann Spruce Ties

J. D. MacLEAN, senior engineer, Forest Products Laboratory, described studies made in the treatment of Engelmann spruce, which timber comprises a large proportion of the stand in several of the Rocky Mountain states, and is very resistant to the penetration of preservatives.

Since the chief objection to the use of this wood for ties is the difficulty experienced in obtaining a suitable treatment, experiments were undertaken at the Forest Products Laboratory to study means of overcoming this obstacle. After the laboratory experiments were completed, arrangements were made with the National Lumber & Creosoting Company and with the Union Pacific to conduct further tests at their treating plants in order to determine the best method of applying the laboratory results under commercial conditions.

The results of these experiments show that Engelmann spruce can be treated satisfactorily with zinc chloride solution, coal tar creosote, or creosote-petroleum mixtures, provided suitable treating conditions are employed. Zinc chloride solution was found in the laboratory experiments to penetrate Engelmann spruce much better than oils. Since this species takes much deeper penetrations of the water solution than of preservative oils under the same conditions of treatment, consideration should be given to the possibility of employing a two-movement treatment for ties. The zinc chloride could be used to protect the wood against decay, and petroleum alone might be found suitable to protect against checking and splitting and to help retard leaching of the preservative salt. Incising was found to be very helpful in obtaining deep penetrations and makes it possible to use a shorter pressure period than would be required for unincised ties.

Fence Posts

THE Committee on Posts, of which F. McCrory, chief tie inspector, Chicago, Rock Island & Pacific, Little Rock, Ark., is chairman, reported on 10 test installations, none of which have progressed to the point where conclusions can be drawn.

R. M. Wirka, associate engineer, Forest Products Laboratory, reported a series of service tests which the United States Forest Service is conducting in various parts of the country to determine the durability of fence posts of different species when untreated and when treated with various preservatives and processes. The conclusions which he drew, based on the data at present available, were that:

The life of fence posts is dependent upon such factors as species, percentage of heartwood and sapwood, size, form (whether round, split, square-sawed or half-round), preservative treatment, if any, and soil and climatic conditions.

The life of fence posts made from non-durable species can generally be increased to 20 or more years by giving them a thorough hot and cold bath butt treatment and a light top treatment with coal tar creosote.

Neither the hot bath nor cold bath treatments with creosote when used alone can be expected to increase the life of the posts as much as the combination hot and cold bath treatment.

While a brush, dip, or soaking treatment with coal tar creosote will generally result in some increase in the life of posts, it will be much less than that obtainable from a good hot and cold bath treatment with coal tar creosote.

A reasonably long life can be expected from posts given a thorough treatment with water gas tar by the hot and cold

bath process. Posts so treated cannot be expected to last as long as when a good coal tar creosote is used.

Posts given a good treatment with copper sulphate by the Boucherie process will give good service.

It is believed that charring is of little value as a method for prolonging the life of posts.

Treated and untreated posts in service in open, well-drained country will give longer service than those in locations that are poorly drained or where the posts are in wooded areas or covered with vines or dense undergrowth.

It is recommended that posts used under the more severe conditions of decay be treated over their entire length. The top need not be given as heavy a treatment as the butts. Even in many regions in the North a treatment of the entire post will be of value in increasing the life of the posts. This is particularly true when posts of non-durable species or posts of durable species which contain a high proportion of sapwood are used.

Other Papers and Reports

A REPORT on The Treatment of Car Lumber reviewed the progress that was made during the last year in the treatment of lumber entering into car construction, showing that a total of 3,131,845 ft. b.m. of timber in the form of sills, decking, flooring, roofing and nailing strips were treated last year, practically all with creosote.

In a paper on Zinc Chloride as a Wood Preservative, L. C. Drefahl, Grasselli Chemical Company, Cleveland, Ohio, reviewed the use of this preservative from its first application in wood preserving in 1838, and described its present uses, and the properties of wood treated with this preservative. He pointed to its adaptability for the treatment of car lumber, mill type building construction, etc., and emphasized particularly its value as a fire retardant and as a protection against termites.

The new rules developed by the West Coast Lumbermen's Association for the grading of Douglas fir timber for structural purposes were described in a carefully prepared paper, by Chester Hogue, of that organization.

A series of tests to determine the fire resistance of wood treated with zinc chloride and diammonium phosphate were described by George M. Hunt, principal chemist, T. R. Truax, senior wood technologist, and C. A. Harrison, junior engineer, all of the Forest Products Laboratory. These tests showed that the tendency of wood to support combustion and spread flames can be practically eliminated by proper chemical treatments. Both diammonium phosphate and zinc chloride, if used in sufficient quantity, are quite effective in reducing the inflammability of wood, the former to a greater degree than the latter, but both require greater absorption of the salts for flame proofing than are necessary for the prevention of decay.

Three Papers on Termites

Three papers which dealt with different phases of the termite (white ant) attacks on railway and other timbers were presented by Charles A. Kofoid, professor of zoology, by Merle Randall, professor of chemistry, both of the University of California; and jointly by George M. Hunt, Forest Products Laboratory, Madison, Wis., and T. E. Snyder, Bureau of Entomology, Washington, D. C. Professors Kofoid and Randall are members of the advisory council which is directing the work of the Termite Investigations committee which was formed in California in August, 1928. They told of the results of the investigations which have been made, of the wide distribution of the termites, of the serious damage they cause and of the task that confronts the committee in its effort to seek methods of control or eradication. Messrs. Hunt and Snyder made a progress report on an international termite exposure test which is being carried out in co-operation with the manufacturers of various preservatives. Termite destruction may occur in any railway structure built of wood or in which wood is used, except crossties and bridge ties when in service.

In a paper on The Effect of Blue Stain on the Penetration and Absorption of Preservatives, Wallace M. Saling, graduate of the school of forestry, University of Idaho, reached the following conclusions:

With moisture controlled and specific gravity comparable, the penetration and absorption of zinc chloride increases with an increase in the degree of blue stain in western yellow pine.

Zinc chloride has a greater absorption than creosote for the different grades of stain, while the penetration of the two preservatives is quite comparable.

Loblolly pine shows a greater penetration and absorption in the blued when compared with the unblued stock.

The results indicate that moisture, rather than the stain, may have caused the difficulty in penetration and absorption heretofore reported, and that stain increases rather than hinders the penetration and absorption of preservatives.

A paper on the Heat Conduction in Wood was read by J. D. MacLean, senior engineer, Forest Products Laboratory, in which an analysis was made of the data obtained in a series of experiments which were described by R. M. Wirka of the Forest Products Laboratory in 1924. A knowledge of heat conduction in wood is of interest, because it is often necessary to use artificial methods for seasoning timber preparatory to treatment; because the temperature of the wood has an important bearing on the depth of penetration; and since timbers which are treated may sometimes have incipient decay, so that it is of interest to determine whether the temperature which is reached in the timber is sufficient to sterilize the wood. As a result of his analysis, Mr. MacLean concludes that, assuming an initial temperature of 60 deg. F., in the wood, it will require a steaming period of 8 hours to bring a 10-in. round stick to a temperature of 210 deg. F. at a point 4 in. below the surface, and 10½ to 11 hours to reach the same temperature at an equal depth in a 12-in. timber. Since a temperature of 150 deg. F., maintained for not less than 30 min., is required to kill wood-destroying fungi, it is evident that large sticks, such as might be used for piling, cannot be completely sterilized without requiring impracticably long steaming periods.

A paper presented by P. E. Philip, deputy minister and public works engineer, Department of Public Works, Victoria, B. C., describing the treatment of the material entering into a highway bridge across the Fraser river at Quesnel, B. C., contained much information of interest to railway men, particularly with reference to the practicability of framing timber before treatment. This structure consisted of two 150-ft. and three 180-ft. Howe truss spans, all timber for which was framed before treatment at a plant located 450 miles from the site of the bridge. In spite of the complexity of the problem, no mutilation of the timber was necessary in its erection in the field. In the discussion of this paper, W. E. Jackson, superintendent of the A. T. & S. F. plant at Somerville, Tex., stated that 6,881,000 ft. b.m. of timber was framed at this plant last year at an average cost of $3.30 per M. ft. b.m. C. C. Cook, maintenance engineer, B. & O., reported that his road was framing bridge timbers much more cheaply at its treating plant than could be done with hand tools in the field.

Treating Plant Removes 430 Tons of Mud

New plants on M-K-T reduce hardness and remove turbidity at less cost

By C. M. BARDWELL
Assistant Water Engineer,
Missouri-Kansas-Texas Lines, Waco, Texas

The Water Treating Plant at Ft. Worth

TO CLARIFY and soften waters of low hardness and high turbidity, the Missouri-Kansas-Texas has erected and placed in operation at its terminals at Smithville, Tex., and Ft. Worth, two water treating plants which possess several distinctive features. The two plants are similar in design and operate continuously at the rate of 25,000 gal. per hour. The clarification, storage and softening of water are carried on in a cylindrical steel tank of 500,000 gal. capacity, of which 230,000 gal. is available for storage, the clear soft water being drawn off at the top through a floating outlet. Sodium aluminate is used as a coagulant to assist in clarification and to aid the softening process; lime and soda ash are the other reagents used.

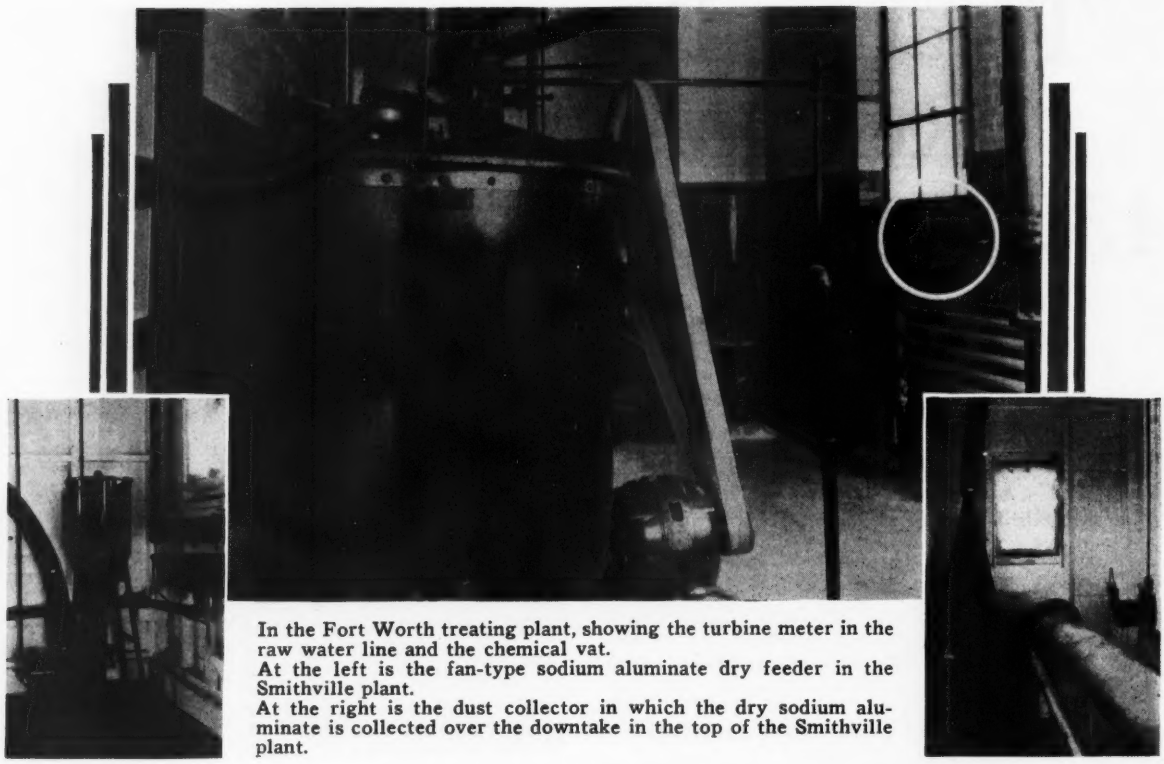
An ingenious device for proportioning the flow of chemicals is attached to the turbine water meter which is installed in the raw water line to the tank where it passes through the machinery room of the plant. An especially-fitted reduction gear is attached and geared to the main shaft of the meter. The main shaft of the reduction gear is fitted with an aluminum drum, which is attached to and wound with a lightweight cable, the other end of which is attached to a swing pipe in the chemical mixing vat. Water passing through the discharge line into the water softener causes the meter to revolve, turning the drum and unwinding the cable which lowers the swing pipe into the chemical tank, thus providing for chemical feed in correct proportion to the amount of water to be treated. High turbidities do not affect the accuracy of the turbine meter, so that in muddy waters this method of proportioning has been found especially satisfactory and under such adverse conditions it functions correctly with variable rates of flow.

The Water Treating Facilities at Smithville

Hardness Varies

At Smithville, the hardness of the raw water, which is pumped from the Little Colorado river, varies between 7 and 17 grains per gallon, and the suspended matter runs as high as 440 grains per gallon. The water softener replaces inadequate storage facilities and a pressure filter which was unable to handle the high turbidity frequently encountered. No attempt had been made previously to soften the water at this point.

The raw water enters the plant through an 8-in. line, and, after passing through the 8-in. turbine meter proportioning device, is carried to the top of the softening tank. This tank is 65 ft. high and 36 ft. in diameter and encloses a downtake 6 ft. 6 in. in diameter. Mixing of the chemicals and water is accomplished by an hydraulic jump into a cone mixing chamber in the top of the downtake, and mechanical agitation has not been found necessary. A by-pass from the raw water line at the top of the tank discharges water into a float box in which is located a float switch, so that the machinery is started or stopped automatically as the water flows into the plant. The lime and soda ash chemical mixing vat is 8 ft. in diameter and 4 ft. 6 in. high. The



In the Fort Worth treating plant, showing the turbine meter in the raw water line and the chemical vat.
At the left is the fan-type sodium aluminate dry feeder in the Smithville plant.
At the right is the dust collector in which the dry sodium aluminate is collected over the downtake in the top of the Smithville plant.

2½-in. by 2½-in. triplex chemical pump and the agitator of the mixing vat are driven from a single shaft by a 3-hp. motor. The dry sodium aluminate is fed separately by a fan type dry feeder operated by a ⅛-hp. motor and is kept dry by electrical heat which is applied at the fan table. The dry aluminate dust is blown through an insulated 3-in. pipe to the top of the tank over the downtake where it is absorbed by a spray of water in a dust collector and drops into the mixing chamber.

Sodium Aluminate a Good Coagulant

Sodium aluminate has proved successful in coagulating the high suspended matter sometimes present in this water. The operator has been taught to adjust the treatment to secure the best clarification. One-half-inch taps at 17-ft. intervals up the side of the tank are piped to a sink below a chemical cabinet in the treating plant house, so that convenient samples can be taken to check the progress of the treatment.

The clear soft water is drawn from the top through a 14-in. pipe of welded steel. This pipe is 31 ft. 8 in. long and works on a swing, the free end being supported by a 110-gal. steel drum used as a float. The 14-in. wrought iron pipe which supports the swing pipe extends 36 ft. 5 in. up into the tank. The maximum rate of upflow is 3 ft. 4 in. per hour and the minimum retention period of the water is 11 hr. The sludge and mud are removed at the bottom of the tank through a system of perforated pipes and are discharged through two 12-in. quick-opening gate valves into a sludge sump at the edge of the tank, which connects to the sewer.

The treating plant house is of frame construction, 36 ft. by 20 ft., and is roofed with asbestos shingles. The chemical storage and charging room, capable of storing two carloads, is separated from the machinery room. The chemical vat is covered and is vented with a flue equipped with an air jet so that the machinery room is kept free from chemical dust. The layout of the chemical feeding machinery is such that there is little waste space, although sufficient room is available to work on the machinery. The elevated storage is especially desirable at this station to furnish fire protection for terminal facilities, since there is no other water supply available for this purpose. This factor was an important consideration in determining the design of the tank.

The water from the Little Colorado river is very difficult to clarify, as it frequently contains high color in addition to heavy suspended matter. The primary function of the plant is to clear the water when it is muddy, and during these periods it is sometimes necessary to eliminate the use of soda ash in the treatment in order to secure the proper hydrogen concentration for the best coagulation. By this means, clear water has always been obtained, although the hardness of the treated water at such times has run as high as six grains per gallon. Tests of 103 laboratory samples, covering the past year, show an average hardness in the softened water of 2.5 g.p.g. The average hardness of the raw water during the same period was 13.7 g.p.g. and the average suspended matter carried in the water was 83.4 g.p.g. During this period, 138,760 lb. of incrusting hardness and 867,000 lb. of mud were removed from the water passing through this plant.

Operating Costs Reduced

The water softener at Ft. Worth is similar in arrangement, operation and other features to the Smithville plant. A cylindrical steel storage tank, 75 ft. high and 30 ft. in diameter, already on the ground, was utilized to build the combined water softener and storage tank, and the house is a 20-ft.

by 34-ft. brick structure. The unfiltered raw water is pumped from the Trinity river and, although it is turbid at times, it rarely carries over 30 g.p.g. of suspended matter. The hardness of the raw water varies between 6 and 10 g.p.g.

The better quality of this raw water permitted the use of somewhat smaller equipment for feeding lime and soda ash. The chemical vat is 6 ft. 6 in. in diameter and 4 ft. 6 in. high. A 3-in. by 3-in. simplex chemical pump and the agitator in the chemical vat are driven by a single 2-hp. motor. The sodium aluminate from the dry feeder is dissolved in water and pumped to the top of the tank by a small centrifugal pump operated by a 1-hp. motor. Since the plant has been placed in operation and regulated, clear softened water containing 1.5 g.p.g. hardness has been obtained. These plants perform the function of the filter and storage facilities at less cost of operation and with smaller investment in equipment and at the same time they soften the water and condition it properly for boiler use.

The design and construction of these plants were carried out under the supervision of J. H. Davidson, water engineer of the M-K-T, as a part of the terminal facilities which were constructed under the general supervision of F. Ringer, chief engineer. The chemical proportioning devices were furnished by the Graver Corporation, East Chicago, Ind.

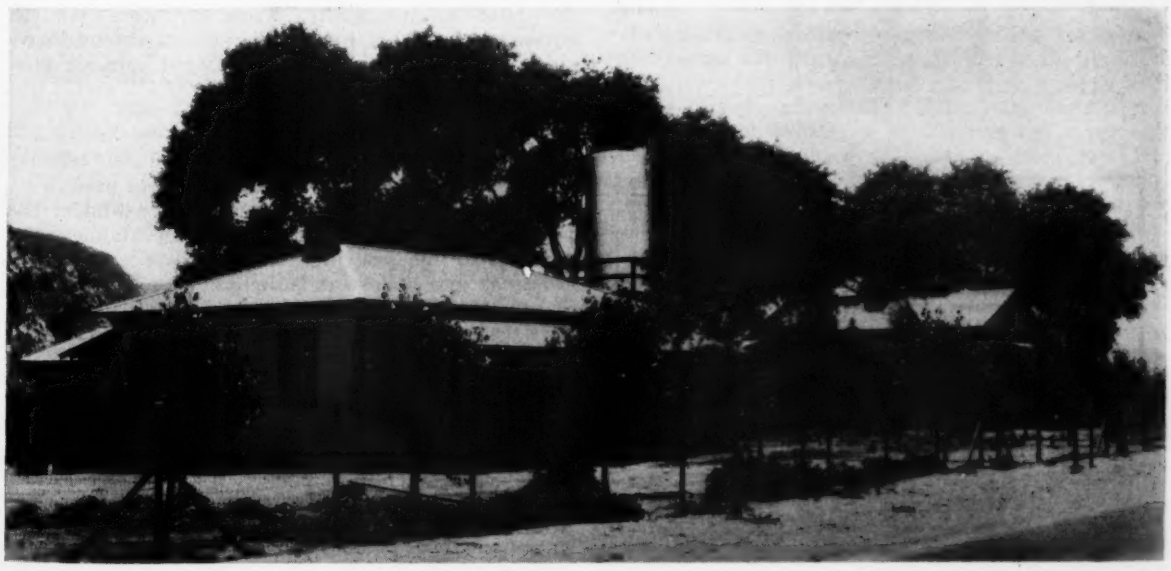
New Houses for Foremen
on the Southern Pacific

IN THE August, 1929, issue, an article described the policy of the Southern Pacific in providing housing facilities for its track and station forces and recent improvements in the design and construction of these dwellings were discussed. However, development along this line has been such that additional dwellings, embodying some new features, have since been completed and are now in use. At Castaic, Cal., two dwellings have been erected, one for the section foreman and the other for the use of section laborers. These buildings are of frame construction.

The section laborers' dwelling, the arrangement of which is a departure from the conventional plan, consists of four apartments of two rooms each. Each family has its own front and rear entrance and there are no interior connecting doors between the apartments. A well ballustraded and roofed front porch with a concrete floor runs the entire length of the building and provides ample space for each family. The two rooms of each apartment are large and roomy. The living room opens onto the front porch and the kitchen, which is directly to the rear of the living room, connects with a latticed-in wing at the rear of the house. This wing, which also has a concrete floor, contains a toilet for each family, two showers lined with sheet metal and equipped with movable wood gratings on the floors, a cast iron water-jacketed heater for furnishing hot water for laundry and bath and ample laundry space.

This building has a concrete foundation and is roofed with asbestos shingles of varying shades of colors. The exterior is covered with drop-siding or rustic and the interior with tongue and grooved material. All woodwork is painted. This type of building has been found satisfactory and similar ones of two, six and eight apartments are contemplated.

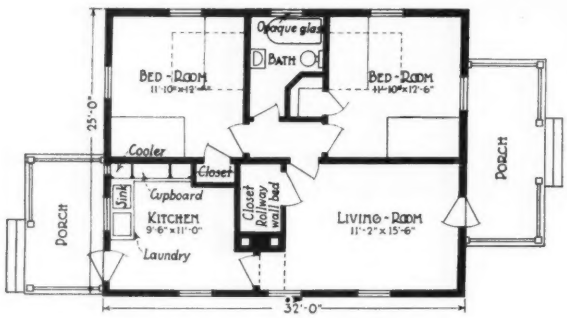
In the section foreman's house at Castaic particular attention has been given to the problem of securing the maximum of convenience in every detail. When the space available is limited, it is necessary to arrange closets, bathroom and the various kitchen conveniences,



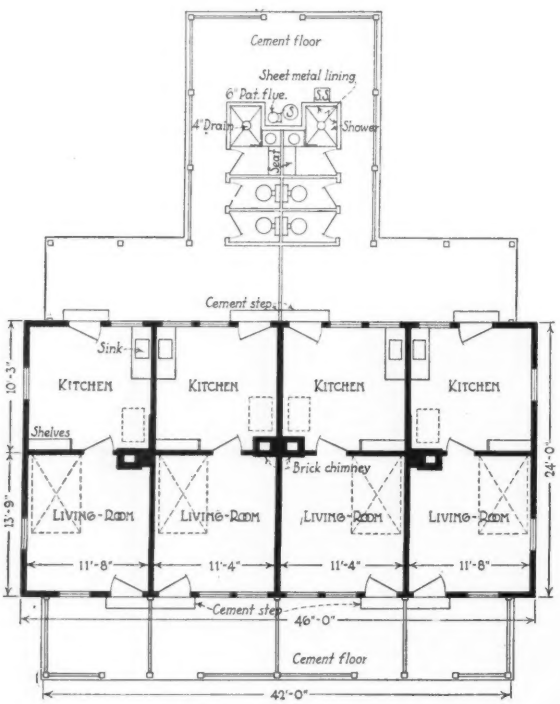
The Section Quarters at Castiac, Cal.

so that they will occupy a minimum of space and at the same time fill the requirements of convenience. The accompanying diagram of the floor plan of this house shows how well this problem has been solved. Care has also been taken to provide ample front porch space and to give it an attractive appearance. This building is of the same type of construction as the section laborers' dwelling, except that the porches are floored with tongue and grooved material and the interior is covered with Celotex.

At McCredie Springs, Ore., three operators' cottages have been erected which embody the same principles of compact arrangement. Even though these dwellings contain only three rooms, the extra space secured by entirely enclosing the rear porch and making it an integral part of the house and by enclosing the front porch with glass, renders the dwellings comparable to those with four rooms. The enclosed front porch serves the double purpose of giving the house a more pleasing appearance and of providing protection against the severe winters that are prevalent in this region, which is high in the Cascade mountains. These cottages are similar in construction to the section foreman's house at Castaic.



Standard Plan for Section Laborers' Houses



Floor Plan for Houses Provided for Section Foremen and Signal Maintainers

One of the Three Operators' Houses at McCredie, Ore.

We are indebted to W. H. Kirkbride, engineer maintenance of way and structures of the Southern Pacific, for the information in this article.

More Prizes Awarded

WE PRESENT below the awards following the annual track inspections of the Hocking Valley, the Pere Marquette, the Richmond, Fredericksburg & Potomac, the New York Central (Buffalo and East), and the Southern, supplementing the accounts of the inspections on the Lehigh Valley, the Canadian Pacific, Eastern Lines, and the Norfolk & Western in the January issue, and the inspections of the Pennsylvania in the December issue.

142 Foremen Rewarded on Southern

Following the annual track inspection on the eastern lines of the Southern, during which definite ratings were assigned to each section foreman's territory, $2,130 was distributed in first and second prizes to section and bridge and building foremen. Out of a total of 142 prizes, 30 were given to bridge and building foremen.

Two classes of prizes are awarded by the Southern, a first prize of $20 and a second prize of $10. In past years, motor cars were awarded as first prizes to those foremen whose sections were not so equipped, but this practice has been discontinued since all of the sections on the eastern lines are now provided with motor cars.

Thirty-Fourth Inspection of Hocking Valley

The thirty-fourth annual inspection of the Hocking Valley was conducted by a small group of officers on December 2 and 3. As has been the custom in the past, the inspection combined the observations of the party as to line, policing and general order, ties and crossings and ballast and ditches, with the mechanical test for low joints and cross level, made by the Erie test car. The inspection revealed a general and almost uniform improvement in maintenance over the six supervisors' districts, and the record of low joints made by the test car showed a marked reduction from that of last year.

Both percentage rating and percentage of improvement were taken into consideration in the award of prizes to supervisors and foremen. The first prize of $100 went to C. H. Ward, Logan, Ohio, supervisor of District No. 5 of the River division, whose territory showed the highest percentage of improvement, while the second prize of $75 was awarded to E. C. Snouf-

fer, Fostoria, Ohio, supervisor of District No. 1 of the Toledo division, whose territory showed the highest degree of maintenance. The third prize of $50 went to L. J. Quinn, Logan, Ohio, supervisor of District No. 4.

First, second and third prizes of $50, $25 and $10, respectively, were awarded to the three foremen on each district whose sections showed the highest ratings, a total of $425 being awarded to 15 foremen.

Eight Foremen Rewarded on the R. F. & P.

Two sets of prizes of four each were awarded to foremen on the Richmond, Fredericksburg & Potomac as a result of the annual track inspection for 1929. In the practice of this road, one set of four prizes is awarded solely on the basis of the physical characteristics of the track as judged by a special marking committee, and a second set of four prizes is awarded solely on the basis of the cost of maintenance. The winners of the second set of prizes are selected by dividing the annual cost of maintenance on each section by the rating given each section by the marking committee, which results in a definite cost per point of rating for each section. Those foremen whose sections show the lowest expenditure per point of rating are awarded the second set of prizes. The four prizes in each set of awards made this year were $100, $80, $60 and $40 respectively, which resulted in the distribution of a total of $560 in prize awards.

As a result of the 1929 inspection, which was held on December 4, Thomas Ogden, foreman of Section 23, at Franconia, Va., was awarded the first prize on a basis of general maintenance. The other three prizes on this same basis were awarded as follows: Second prize, W. H. Sisson, Section 24, at Alexandria, Va.; third prize, J. S. Carpenter, Section 14, at Fredericksburg, Va.; and fourth prize, Herbert Skinner, Section 8, at Penola, Va.

The four prizes awarded on the basis of the cost per point of rating were awarded to the following foremen: First prize, W. H. Sisson, who was second prize winner on the basis of general maintenance; second prize, L. T. Surles, Section 13, at Massaponax, Va.; third prize, W. W. Lowry, Section 4, at Elmont, Va.; and fourth prize, E. L. Pugh, Section 5, with headquarters at Ashland, Va.

New York Central Awards Monthly Premiums

In the New York Central plan of awarding prizes, the lines east of Buffalo are divided into five classifications and then subdivided into groups, each group within the different classifications containing only sections similar in character. The inspection is made by a main committee on certain of the more important lines, and by special subcommittees on the less important lines. As in past years, the prize awards were made in the form of premiums, which are added to the regular compensation of the winners. The foremen who receive the highest ratings in their respective groups are awarded monthly premiums of $5 throughout the year. In addition, the foremen who receive the highest rating in each of four of the five main classifications receive an additional premium of $3 a month, which, with the group premium, amounts to a total premium or prize of $8 a month. In one of the classifications $2 a month is awarded to the foreman with the highest rating in addition to the group premium of $5 a month. In addition to the regular group and classification premium awards, cash prizes of $10 gold pieces are given to those foremen who have received the highest ratings in their respective groups for four or more consecutive years.

The following foremen were the winners of the classification premiums for 1929:

Classification 1, A. Burke, Subdivision 13 of the Buffalo division

Classification 2, E. Teats, Subdivision 27 of the Pennsylvania division

Classification 3, M. Duquette, Subdivision 9 of the Adirondack division

Classification 4, F. Simons, Subdivision 17 of the St. Lawrence division

Classification 5, John Smith, Subdivision 13 of the Buffalo division.

In addition to winning the classification prize, Mr. Teats and Mr. Duquette were also awarded $10 gold pieces, having received the highest rating in their groups for seven and four consecutive years, respectively. J. Andros, Subdivision 3 of the Eastern division, also received a $10 gold piece in addition to being a group winner, having had the highest rating in his group for seven consecutive years.

Subdivision 13 of the Buffalo division, of which T. J. Sexton is supervisor, received the highest average rating of 85.4 per cent. The second highest subdivision rating was 84.9, and was given to Subdivision 10 of the Syracuse division, of which W. N. Skelton is supervisor.

The Buffalo division, with an average rating of 84.9, again received the highest division rating, while the Mohawk division and the Syracuse division were tied for second place with ratings of 83.3. The general average rating for the lines east of Buffalo was 83.2, as compared with ratings of 83.5 in 1928, and 83.2 in 1927.

Pere Marquette Awards 33 Prizes

The annual inspection of the Pere Marquette lines took place on October 14-18, 1929. The inspection party was divided up into seven committees, as follows: (1) Line and surface; (2) roadbed and drainage; (3) roadbed and ballast cross-section; (4) policing right-of-way and station grounds; (5) fences, crossings and signs; (6) signals and interlocking, and (7) shops, shop grounds, repair tracks and enginehouses.

In awarding prizes to supervisors and foremen of supervisors' subdivisions, the ratings of the first five committees only were considered. The prize of $100 for the supervisor's territory having the highest percentage rating went to T. D. Harrington, supervisor of the territory on the Toledo division from Bay City, Mich., to south of Holly. The other prize of $100, going to the territory showing the greatest improvement over 1928, was awarded to N. Jorgensen, supervisor of the territory on the Muskegon division between Holland, Mich., and Muskegon.

In addition, prizes of $25 each were awarded to the foremen of 13 supervisors' subdivisions, whose territories showed the best general condition, while other $25 prizes were awarded to the foremen of 12 subdivisions for the greatest improvement of the year. Other prizes of $25 each were also awarded to six foremen on branch lines, namely, to the three whose territories showed the best general condition and to the three whose territories showed the best improvement of the year. The territory of H. J. Bogardus, division engineer of the Toledo-Ludington division, received the highest rating of any of the divisions.

Four Derailments Caused by Track Conditions

Three of the accidents resulted directly from neglect on the part of the maintenance forces

THE Interstate Commerce Commission issued three accident reports during the month of November and one in December which are of special interest to maintenance men. They cover derailments in which a total of 8 persons were killed and 139 injured.

Split Head Derails Train

The most serious of these accidents occurred on the Erie about 2½ miles east of Corning, N. Y., on July 11, 1929, where, through an unusual combination of circumstances, the derailment of a westbound freight train, the wreckage of which was struck by an eastbound passenger train, caused the death of 6 persons and the injury of 65 others. The investigation of the accident, which was made jointly by the railway, the Interstate Commerce Commission and the Public Service Commission of New York, indicated that it was caused by a broken rail. The derailment took place near the center of an intermediate passing siding. At the point of accident, the track is laid with 33 ft. 100-lb. rails, supported on 18 ties to the rail length, and is ballasted with crushed stone. The report of the Bureau of Safety of the Interstate Commerce Commission indicates that the general maintenance was good.

The freight train, which consisted of 128 cars, was derailed while running at an estimated speed of 40 miles per hour. Four cars left the track at the point of derailment while 31 others, 5 of which contained gasoline, were derailed, badly damaged or destroyed by the fire which followed. In addition, three cars near the rear of the train buckled and fouled both main tracks. The twenty-fourth car, which was one of the gasoline tank cars, fouled the eastbound main track and was struck by the engine of the passenger train, which reached the point of the derailment only a few seconds after it occurred, while running at an estimated speed of 45 miles per hour.

The passenger train, No. 6, consisted of 10 cars, including four Pullmans, all of which were of all-steel construction, except the express and dining cars, which had steel underframes. The first four cars were badly damaged and caught fire immediately.

The rail which caused the accident was examined by James E. Howard, engineer-physicist for the Interstate Commerce Commission, whose report, in part, follows:

The accident apparently was due to a split-head rail. This rail was fractured 24 ft. 11 in. from its receiving end. Then followed a gap of 5 ft. 9 in., representing fragments which were not accounted for, and this gap was followed by a fragment 28 in. long, which represented the leaving end of the rail, an aggregate of 33 ft.

The leaving end of the long fragment displayed a split-head fracture, while the receiving end of the short fragment also displayed a similar defect. Two feet and seven inches of the leaving end of the long fragment also displayed a fracture under the split head, separating it from the web. The surface of this fracture was worn and battered, indicating that it had existed prior to the time of the accident. This fracture, originating a short distance below the running surface of the head, had extended downward through the depth of the head, bifurcated and reached the surface at the fillet of the web, thus completely separating the head from the web. There is no doubt that this represented the condition of the rail when the train which was derailed entered upon it. The split-head fracture had also reached the surface at the fillet of the web of the 28-in. fragment. These facts lead to the belief that, over a considerable part or the whole of the length of 10 ft., the fracture had been in sight prior to the accident.

The dimensions of the fracture, as exhibited a few inches beyond the receiving end of the 28-in. fragment, were 0.2 in. wide at the top and 1.4 in. deep. Fractures of this type are wider at the top, tapering to zero at the bottom. Since they originate at the top and extend from the point of origin, necessarily they are of zero width at the bottom.

The longitudinal fracture of this rail began about a quarter of an inch below the running surface, but from its point of inception oblique shearing fractures formed which passed upwards until only 0.15 in. of unfractured metal remained above the shearing fractures. The metal immediately below the running surface of the rail shows flattening of the grain of the steel, as a result of the lateral flow of the metal under wheel pressure. When this lateral flow of metal encounters a longitudinal streak or acicular seam in the upper part of the head, an opportunity is presented for the inception of a split-head fracture.

A distinction is made between a split-head fracture and a piped rail, since they result from different causes, each independent of the other. Split-head fractures result from acicular seams which are located near the peripheral surface of the cross-section of the rail in its head and base. In certain parts of the cross section, these seams appear as short dashes under the varying influence of the roll during fabrication. Little attention need be paid to these seams or streaks in those parts of the rail which are not subject to a lateral flow of metal under service conditions. The seams in the upper part of the head, however, afford opportunity for the display of split-head fractures.

Piped rails have structural planes of weakness in the upper part of the web and lower part of the head. They result from a pipe, a shrinkage cavity in the upper part of the ingot. Pipes never occur in the lower part of the ingot, consequently no piped rails come from that part of the ingot. Split-head rails, on the other hand, may come from any part of the ingot, since slag inclusions have been found in the lower as well as the upper parts of the ingot.

A piped rail is not necessarily a weak rail; the web, being exposed chiefly to vertical compressive stresses, possesses sufficient strength to sustain the wheel loads.

The intense impinging pressures at the running surfaces are distributed when they reach the web and lower part of the head and are diminished to unit stresses which the metal of the rail has the ability to endure successfully.

Skeletonized Track Causes Derailment

The derailment of a northbound passenger train on the Atlantic Coast Line near Endfield, N. C., on July 10, 1929, which resulted in the injury of 50 persons, 41 of whom were passengers, is believed to have been caused indirectly by the failure of the section foreman to place a slow order over track that was skeletonized in preparation for the renewal of ballast. The train was running at a speed variously estimated to have been between 30 and 55 miles an hour and, while passing over a section of track that had been stripped for application of stone ballast and in which new ties were being installed, the rear truck of the dining car, the ninth car in the train, was derailed, and this was followed by the derailment of the five sleeping cars to the rear.

In his report of the derailment, W. P. Borland, director, Bureau of Safety, says in part: "This accident was caused by insecure track conditions. The indications are that, in stripping the ties for ballast, the material was disturbed under the east end of the ties and partially or completely removed, resulting in the ties being inadequately supported at their east ends and continual thrust at a weak point on this side of the track, which appeared to have been noticed by various witnesses riding in different parts of the train, finally caused the east rail to turn over. That a dangerous condition had developed on this stripped track seems apparent from the statement of the engineman of a freight train, which passed about one hour and a half prior to the accident, to the effect that his train probably would have been derailed if it had been moving at a higher rate of speed, and it is believed that a slow order should have been put out for the protection of this section of track."

Gravel in Flangeway Derails Train

The third report covers the derailment of a passenger train at a highway grade crossing on the Chicago & North Western, near Princeton, Wis., on July 15, 1929, in which one employee was killed and 13 other persons were injured. The investigation of this accident, which was made jointly by the railway, the Interstate Commerce Commission and the Railroad Commission of Wisconsin, indicates that the track at the point of accident is well maintained.

The eastbound passenger train which was involved, consisted of one combination baggage and mail car and three coaches, all of all-steel construction, and was running at a speed of 35 or 40 miles an hour when derailed. The entire train was derailed to the right, the engine demolishing a 7-span pile trestle 91 ft. long, which is located 365 ft. east of the crossing.

At the crossing in question 4-in. by 8-in. planks are laid close to the outside of each rail, with the top surfaces level with the top of the rail. Flangeways 2½ in. wide are provided by laying a 60-lb. rail on its side with the head against the running rail, and another plank of the same dimensions is laid along the inside of these flangeways. The highway, which approaches from the south on a slightly descending grade, has a gravel surface which is laid up to the outside planks and between the inside planks.

The evidence indicated that the flangeways fill up quickly with gravel owing to the automobile traffic on the highway, the section foreman saying that it is necessary to clean out the flangeways four or five times a week. The accident happened on Monday morning, there having been no other trains over the district since Saturday night and, while there was some conflict in the testimony as to the exact condition immediately after the accident, it was the conclusion of the investigating bodies that the flangeways became filled with sand and gravel over the week-end to such an extent that the flanges of the engine truck wheels were unable to clean them out so that they rode up over the gravel and were derailed.

Sand Washing Over Track Derails Train

A somewhat similar derailment of a passenger train occurred at a highway crossing near Glenwood, Ala., on the Andalusia district of the Central of Georgia, on August 29, 1929, in which one person was killed and one injured. In this case, however, there was no implication of neglect on the part of either the maintenance forces or the train crew. The crossing in question is located in a light cut and crosses the track at a slight angle. The highway approaches the railway on a descending grade of 5 per cent from the south and 3.9 per cent from the north. At points about 25 ft. from the track on each side, bulkheads or ridges have been erected across the roadway to divert storm water into the side ditches. There are also surface ditches at the top of the cut on the north side of the track to intercept surface water, so that it will not reach the highway and flow onto the track. The highway, which is unimproved, is 24 ft. wide, the road surface being composed of a mixture of sand and clay. The crossing is not planked, the highway being carried across the track by a filling of the same material which constitutes the road surface. Owing to grade conditions, the view of the crossing is restricted to 700 ft. for eastbound trains.

There had been a heavy rain between 3:00 and 3:20 p. m. in the vicinity, which covered an area of about two miles, but it was not raining at the time of the derailment, which occurred at 3:40 p. m., as a result of sand washing over the rails to a depth of 2½ to 3 in., for a distance of about 10 ft.

The evidence indicated that at the time of the derailment the section foreman was at Goshen, 4½ miles east of the crossing, at which place there was a very light rain, and was not aware that a heavy rain had occurred. In any event, such a short time elapsed between the rain and the derailment that there had been no opportunity to discover the condition of the crossing before the passenger train arrived.

The foreman testified that he had patrolled the track that day, walking over it in both directions, but found nothing wrong. The drainage was good, the side ditch on the north side of the track having been cleaned out about 10 days before, while the ditch on the south side was open so that no work was done on it.

In his report of the accident, W. P. Borland, director of the Bureau of Safety, I. C. C., said that, "Neither the train crew approaching from the west nor the section crew located east of the crossing had any knowledge of such a storm having prevailed. The view of the crossing is restricted, but, since the sand was the same general color as the crossing, it is doubtful whether it could have been detected except from a very short distance."

B. R. & P. Bulletin Urges Proper Methods

BULLETIN No. 8 of the series that is being issued by the engineering department of the Buffalo, Rochester & Pittsburgh to its forces in the maintenance of way, bridge and building, and signal departments, stresses the importance of first class work in every respect and also calls attention to the value of co-operation between the various departments charged with the maintenance of the roadway and its accessories.

The value of this method of imparting uniform general instructions is illustrated in the present bulletin by reference to preceding bulletins. Thus, when referring to the supply and condition of tools, the men are admonished to re-read Bulletin No. 1, dated August 15, 1927. In like manner, bulletins concerning other details of the work are referred to and further pertinent instructions and suggestions are given.

A description of the practice of the B. R. & P. in issuing these bulletins was published on page 217 of the May, 1928, issue of *Railway Engineering and Maintenance*, in which Bulletin No. 5, relating to the spring clean-up was reproduced. Bulletins No. 4 and 7, on drainage, were reproduced on page 389, of the September, 1928, and on page 474, of the November, 1928, issues, respectively, while a reproduction of Bulletin 420 on preparing for winter appeared on page 420 of the October, 1928, issue. In the July, 1929, issue a reproduction of Bulletin No. 2 on the details of maintenance work was printed on page 302.

not only the new ones as they are put in, but all others that are loose. Carry the surfacing and lining along with tie renewals and remember that **good surface cannot be maintained without good line.** Adjust rail anchors, dig out muddy ballast and replace with fresh ballast. Restore ballast and roadbed shoulders and clean up as the work proceeds.

When digging out muddy ballast, cut the old ballast down below the bottom of the ties at ends of ties to get good drainage, **and be sure to have an ample supply of fresh clean ballast on hand for backfilling. Only a limited amount of raising can be done this year,** which makes it all the more important to do a first-class job of spotting up.

Dispose of old ties promptly. Burn the untreated ones. Read again instructions regarding treated ties taken out of track. **Don't allow treated ties to be destroyed under any circumstances.**

WHAT IS THE CONDITION OF SIGNAL MECHANISMS?

These mechanisms have given and continue to give good service, but let us not overlook the fact that many of them have been in service nearly 20 years and none less than 12 years. Because they give little or no trouble we must not neglect them. Look for wear in the smaller gears, for loose keys and worn keyways, check circuit breaker contacts for loss of tension, examine rollers for flat spots. A mechanism will probably continue to function with any one of these defects, but if they should increase in any considerable number of our signal mechanisms, we would have a serious condition. Every maintainer on his monthly inspection and the Inspectors on their regular inspections should give special attention to signal mechanisms. Any part showing excessive wear or defect should be replaced. **The general condition of our signal mechanisms as well as the rest of the signal system must be kept up. In doing this we will be following our established policy. Maintenance instead of repairs.**

WHERE DO WE STAND ON REPAIRS AND RENEWALS TO BRIDGES AND BUILDINGS?

Read over Bulletin No. 6, dated July 6, 1928.

Whether making running repairs or complete renewals, **first-class work must be insisted on and carried out.** Don't overlook making necessary minor repairs to all structures in the immediate vicinity of where the gang is working, **arranging in advance for the necessary material and so avoid lost time and effort in going back to finish up. Clean up neatly after the work. Appreciate attractive appearances.**

Get familiar with new standard plans for pile and frame trestles and bulkheads and allow no departure from details shown on these plans.

Review again instructions for mixing, placing and finishing concrete by the Water-Cement Ratio Method. Be guided by the slump test when mixing and placing concrete. Use only clean washed sand, **clean washed gravel or washed stone and pure water.**

Don't attempt to paint bridges or buildings without first thoroughly cleaning. Stencilled dates are frequently forgotten. Don't let this happen.

IS THE IMPORTANCE OF CAREFUL HANDLING OF SIGNAL CIRCUITS FULLY APPRECIATED?

Before a new installation of signals or a new interlocking plant is placed in service, the greatest care is taken to know that every circuit is as it should be and that a proper signal indication is given in every instance. During the summer months when automatic signals are rewired and when highway crossing signals are installed, with control circuits interwoven with the existing signal circuits, the necessity for the most careful procedure is as great and perhaps greater than in the case of a new out-of-face installation. Where rewiring is done, an additional circuit installed, or changes made in existing circuits, no matter how simple or unimportant it may seem, take nothing for granted. Before beginning the work study the plan and become familiar with what is to be accomplished and how it is to be done. After completing the work **and before leaving the location make a**

BUFFALO, ROCHESTER AND PITTSBURGH RAILWAY COMPANY

BULLETIN No. 8

FIRST CLASS WORK IN EVERY RESPECT IS WHAT COUNTS IN MAINTENANCE
ALWAYS KEEP DRAINAGE IN MIND

The heavy working season is here, but the time is short in which to complete necessary maintenance work before bad weather sets in. Lest we forget the importance of right methods and thorough attention to details, we should refresh our memory on these important matters.

IS THERE AN AMPLE SUPPLY OF TOOLS AND ARE THEY IN GOOD SAFE CONDITION?

Read again Bulletin No. 1 dated August 15, 1927.

Good work cannot be done with poor or insufficient tools. It is the duty of the Foremen and Maintainers to have enough standard tools and to keep them in proper condition.

WEED OUT WORN-OUT TOOLS

Don't allowthe use of unsafe or defectvie tools. Keep motor cars and push cars in first-class condition and clean at all times. Inspect such equipment daily, reporting any trouble which cannot be fixed on the job and insist on it being taken care of. Get a full day's work out of every labor-saving machine.

IS THE NECESSITY FOR CO-OPERATION BETWEEN DIFFERENT BRANCHES OF THE DEPARTMENT ALWAYS KEPT IN MIND?

In track and signal work one involves the other to such an extent that co-operation is indispensable at all times, but with the rush of the season's work when the plans and accomplishments of each department are more than ever dependent upon the other, there comes the necessity for real co-operation, both in spirit and in practice, which can only be obtained by a full discussion and understanding of the joint problems.

Rebonding of fouling sections as well as the rebonding of main track should be continued. Good bonding in fouling sections is necessary to the safe operation of signals.

Insulated joints, although inspected out of face during the month of April, must not be forgotten in the rush of the season's work. Watch end posts and other fiber parts, renew them before they give trouble. See that every joint is given a buzzer test on the regular inspection in January, July, April and October. Test each angle bar for contact with the rail; test every bolt for contact with the angle bars.

WHAT ABOUT TIE RENEWALS?

Read again Bulletin No. 2, dated September 1, 1927

Treat all ties right by avoiding abuse of any kind and providing tie plates of the proper weight and size and dating nails. Tamp ties honestly with picks or tamping bars.

complete check of the operation of the signals from all angles. Remember all wires and all binding posts look alike and even with careful marking it is easy to be mistaken. Better to take a little more time and be sure than to hurry and be sorry.

WHAT INSTRUCTIONS GOVERN LAYING NEW RAIL?

See Bulletins Nos. 2 and 6.

Each section foreman must be present when rail is laid on his section and is jointly responsible for the work; accept this responsibility in the right spirit, and co-operate fully with the signal men in their part of the work. **Don't forget expansion shims.** Use the proper size as the thermometer directs. Don't mix Goldie and cross rib sloped tie plates. Full-bolt and spike new rail before tying up at night. Make safety the first consideration and leave no loose or hanging ties or other doubtful conditions. Don't neglect or slight the bonding.

This season will see the first use of A.R.E.A. Section 100 lb. rail known as R.E. rail. Get posted fully on the different kinds of track fastenings to be used with this rail, tie plates of larger size, oval neck track bolts, head free joints and outside strand bonding with special type of protectors.

WHAT IS THE FIRST ESSENTIAL FOR GOOD TRACK? DRAINAGE, ALWAYS KEEP IT IN MIND

Read again Bulletin No. 4, dated December 15, 1927, which tells the whole story

Stop and consider how much improvement good drainage has already made and be alert to find and correct bad conditions. Improve drainage at highway and farm crossings. Ditch, lay drain tile, place drain boxes and pipe to keep water away from the track and from under the track at crossings. Construct ditches of the proper size and slope at sides of crossings and pave them with field stones. Construct diversion ditches, if possible, some distance from the track, especially where the road slopes toward the track, to catch the water and prevent it from running down over the crossing. When side ditches are paved at crossings widen out the road near the track if possible and do not make slopes of ditches too steep. Pave inlets and outlets of pipes and culverts where heavy flow causes erosion. Take care of such work along with tie renewals, surfacing and lining.

Watch out for unsafe conditions at crossings and correct them. Cut brush which interferes with the view and do not allow any avoidable obstructions.

The men who familiarize themselves with the fundamental principles of their work and are thorough in all details are the leaders in their field.

Remember first-class work in every respect is what counts in maintenance.

Always **keep drainage in mind.**

E. W. HAMMOND,
Engineer Maintenance of Way

W. L. CONNORS,
Signal Engineer

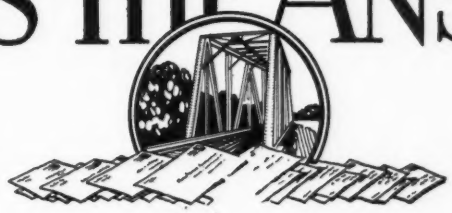
Approved

Rochester, N. Y.,
July 18, 1929

E. F. ROBINSON,
Chief Engineer

B. R. & P. Bulletin Emphasizes Value of First Class Work in Every Respect

WHAT'S THE ANSWER?



Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE APRIL ISSUE

1. *How should a section gang of from six to eight men be organized in unloading ties from stock or box cars, from the standpoints of efficiency and safety?*

2. *What time of the year is best for setting out trees and shrubbery around section dwellings, in station grounds or elsewhere? What precautions should be observed in doing this?*

3. *What methods are most practical for preventing washing and deposits on the right-of-way by water in side ditches?*

4. *What are the relative advantages of wood block, brick, bituminous compounds and concrete for platforms in coach yards, from the standpoint of maintenance? Should the curbs be flush with or higher than the platform?*

5. *What details should be given particular attention in making an inspection of a timber trestle?*

6. *What are the advantages, if any, in requiring pumpers to make a daily report of water pumped and supplies used?*

7. *How many assistant foremen should be provided for a rail-laying gang of 150 men, and how should they be assigned?*

8. *What are the advantages, if any, in the use of the spray gun in the painting of steel bridges?*

Mountings for Locomotive Cranes and Steam Shovels

What are the relative advantages of caterpillar and standard railway mountings for steam shovels and locomotive cranes?

Caterpillar Mountings Have Many Advantages

By District Engineer

While the locomotive crane, fitted with standard railway mounting, is an extremely useful machine, it lacks something in flexibility, since its use is confined to a limited area alongside established tracks, unless temporary tracks are constructed to enable it to reach otherwise inaccessible places. The caterpillar mountings give a greater degree of flexibility, since they are completely mobile and can be used in material and tie storage yards, and at practically any point on the right of way without regard to track facilities, topography or soil conditions and, frequently, in cramped quarters where other forms of equipment cannot be employed.

We have used several machines with this type of mounting for widening and ditching cuts, and under some circumstances, have found them superior to machines which are confined to the track, since they give a greater reach from the track, and as many cars can be loaded at one time as the interval between trains permits, while a finished job can be left behind the machine. By means of a dragline attachment, we have been able quickly to clean out stream channels that otherwise would have required a large amount of hand labor. We have also used these machines for excavating building foundations, for grading driveways, for laying tile in cuts, for digging trenches for water and sewer lines, and in many other operations where the use of a crane on the standard mounting was impracticable. In all of these applications they have demonstrated a high degree of economy, since, if they had not been available, the work would, of necessity, have required hand labor.

Caterpillars Give Greater Flexibility

By Supervisor of Work Equipment

Caterpillar mountings have found considerable favor in recent years in construction work where railway tracks are not accessible. While they have not as yet been used to any great extent by the railways, those roads which are using them have found that they possess a number of advantages. As compared with the standard railway mountings for locomotive cranes, they show greater flexibility, since they can be used for cleaning out ditches, excavating foundations, driving piles and performing other work that cannot be reached by machines which must work from the track. On the road with which the writer is connected, one of these cranes has also been used by the stores department for handling scrap, and in this case it has been possible to avoid the construction of additional tracks, since the scrap piles can be made wider, thus decreasing the amount of track frontage required. There are many operations which are demanded of locomotive cranes, however, that can be performed better by machines equipped with standard railway mountings, such as placing bridge material, setting culvert pipe and other heavy work that requires reaching alternately from one side of a main

track to the other, or that requires a high degree of mobility over long distances.

When used on steam shovels, the caterpillar mounting is so much superior to the railway mounting that it is practically displacing the latter. It gives greater flexibility and assures quick movement in the pit, while its use permits the elimination of the jack crew, thus reducing the labor costs.

The Use of Existing Bents

In changing from open to ballast-deck construction, is it good practice to allow existing creosoted pile bents to remain if they are in good condition? If so, should they be cut down, or should the track be raised to accommodate the change, when the grades will permit the latter method?

Good Bents Should Be Retained

By C. S. Heritage
Bridge Engineer, Kansas City Southern, Kansas City, Mo.

In changing from open to ballast-deck construction, it is good practice to allow the existing creosoted pile bents to remain, provided they are in excellent condition and have sufficient piles for the loading desired.

When such a change is made, it will be necessary to cut the piles down about one foot or raise the grade of the track an equal amount. Local conditions will determine which is preferable in each case. Generally, trestle bridges are located at sags in the grade lines, and the small track raise to accommodate the ballast-deck structure will not be objectionable.

They Should Be Used Whenever Practicable

By H. D. Knecht
Division Engineer, Missouri Pacific, Little Rock, Ark.

The question presupposes definite knowledge as to condition of existing bents to insure their lasting the estimated life of the new deck. The probable change in weight of motive power to be operated over the district during the life of the structure, as well as present panel lengths and the number of piles in the bents, will determine the practicability of using existing bents. Economy dictates the desirability of using them whenever possible.

As a general rule, the small raise in track which the change from open to ballast deck makes necessary, in order to maintain the same elevation of the top of the cap, is not sufficient to justify recutting the piles, and almost invariably can be taken care of readily by means of an easy run-off on the track approaches, in such a manner that it cannot be distinguished.

Cutting Down the Bents Should Be Avoided

By Supervisor of Bridges and Buildings

Where open deck timber trestles are constructed of untreated material, it is not uncommon for the piling to fail from decay or other causes considerably in advance of the caps, stringers and guard rails. If it is the policy of a road to renew bridges of this character with ballast deck structures, it is good practice to renew bents which have failed in this manner with creosoted piles and caps, so that the bents conform to the standards of ballast deck construction, except that the elevation of the cap may be made the same as in the original bents, if the deck is in condition to run for several years with safety. By doing this the necessity of shimming between the new bent and the stringers will be avoided.

In general, structures of this type are located so that there is no difficulty in making the necessary raise to the track, at small expense and without interfering with grade conditions. If the bridge is located on a ruling grade, however, so that the grade condition will not permit the raising of the track, then the new bents should be driven so that the tops of the caps will be at the proper elevation to accommodate the ballast deck later, without requiring a track raise.

Lifting of Crossing Planks by Snow Packed in Flangeways

Where wood plank is used between the rails at highway crossings and station platforms, what means can be taken to prevent the lifting of the planks as a result of the packing of the snow in the flangeways and under the plank?

A Snow-Tight Flangeway Will Help

By M. D. Carothers
Assistant Engineer Maintenance, Baltimore & Ohio Chicago Terminal, Chicago

There seems to be no positive method of preventing the lifting of planks at highway crossings and station platforms. When the snow accumulates to a depth of six inches or more, the planks nearest the rails begin to lift as a result of the packing of the snow by the action of the wheel flanges. The trouble can be minimized, however, by making a flangeway of scrap rail, laid with the head against the web of the running rail. This type of flangeway is practically self-cleaning, since the wheel flanges tend to keep snow and other frozen material plowed out. In this form of construction, the base of the flangeway rail makes a good backing for the crossing plank and, since the snow does not readily get under the plank, this type of crossing will go through several storms before any trouble is apparent. A still further refinement is possible by sealing all the openings between the planks and the rails with some bituminous material. Crossings treated in this manner have gone through an entire winter with no signs of heaving.

A Double Layer of Plank Gives Good Results

By P. J. McAndrews
Roadmaster, Chicago & North Western, Sterling, Ill.

We have been quite successful in overcoming this trouble by the use of two layers of plank, whose combined thickness equals the height of the rail. In making the installation, either at a crossing or in a platform, the bottom plank, which is to lie adjacent to the rail, is framed to fit over the tie plates and spikes, and is placed to a snug fit against the web of the rail. After this plank is spiked, through bored holes, to the ties, the remaining planks of the bottom layer are placed. The top layer is then placed so as to give the proper flangeway space. By using planks of the same width for both layers, the joints are staggered, and there is no opportunity for snow or dirt to work under the planking. This form of flangeway may be used with equal advantage when the entire space between the rails is planked or when a single line of plank is used adjacent to each rail and the space be-

tween is filled with other material. The use of a heavy road oil or other form of waterproofing, poured into the flangeway, is beneficial as it tends to keep moisture from passing under the planking at this point.

A flangeway of this type is self-cleaning, as it forms an almost complete obstruction to the forcing of the snow under the plank, with the result that it is worked out of the flangeway by the passing wheels. Care should be used to see that the planks are all of the proper thickness, since the use of shims between the two layers leaves an opening into which the snow packs quickly, with the result that the upper plank will be lifted.

Keep the Ballast Below the Tops of the Ties

By R. T. Dorsey
Section Foreman, Louisville & Nashville, Louisville, Ky.

Where wooden planks are used in highway crossings and station platforms, the ballast under the planks should not come higher than half the depth of the ties. If this is done, the ballast, even if waterlogged, will not heave enough to interfere with the planks. I have had many years experience in maintaining planked crossings, and it is my observation that when the ballast is considerably below the tops of the ties the planks are not lifted so readily by the swelling of the ballast when it freezes. Flangeways should always be kept clean of dirt and, whenever possible, plenty of salt should be used to prevent the freezing of snow that accumulates in the flangeways.

Wearing Surfaces for Overhead Highway Bridges

What types of wearing surfaces are most suitable for the floors of overhead wooden bridges?

Asphalt Surfaces Give Excellent Results

By I. H. Schram
Engineer Maintenance of Way, Erie, Hornell, N. Y.

The common type of floor used in overhead highway bridges until recent years was of planks, which were generally laid transversely to the girders, upon wooden stringers, which were in turn supported by the floor beams of the structure, either of steel in modern steel spans or wood in the old bridges with Howe trusses. With the advent of heavy loads which result from modern automobile traffic, which frequently includes trucks weighing as much as 15 tons, the maintenance expense of such types of floors became excessive. Annual renewals were necessary in many cases and the situation was aggravated by partly worn planks breaking under heavy loads. Modern overhead highway bridges have been designed and are being installed with permanent floors, usually reinforced concrete, with paving conforming to that of the highways which they serve.

The problem of maintaining the old floors remains. In many cases it is not possible, without a complete renewal of the structure, to provide a concrete floor, as the added loads, together with the provision for the heavy traffic, would overload the floor or trusses, or both. Other expedients are, therefore, adopted in most cases. The simplest and the most economical is the application of cast iron traffic treads. It is found that automobile traffic follows the lines of these treads, as they present a much smoother surface than partly worn or irregularly worn plank. There is very little objection to their use in most places and, in general, state highway authorities or municipalities readily approve of their installation, unless there is some unusual condition connected with the structure. Such protests as have been made, have usually been based on steep approaches to the bridge, which generally continue over on the short or approach spans on each end of the structure. In such cases it is not advisable to use traffic treads.

Another scheme which has been worked out for such a layout, consists of a laminated wood floor composed of 2-in. by 4-in. timbers spiked together. These are of treated material and set on edge, and provide a greater thickness and more resistance to wear. The lumber is not planed to exact size, but is left rough. Owing to the variations in the width of the strips, this makes some irregularities, which assist in holding the wearing surface, which is composed of bituminous material placed over the wooden floor and rolled down. If possible to secure it, a ready prepared mixture of asphalt and stone is used and is found to give a life of four to six years, after which it can be patched in a manner similar to material of this kind which is used on grade crossings. A somewhat longer life is secured, however, because of the better foundation and drainage. Floors of this kind are easily and economically maintained. They require a complete renewal of the planking when installed and, are, therefore, more expensive to install than a mere application of traffic treads. In cases of this kind it is generally desirable to investigate the carrying capacity of the stringers, as it is often found that by adding some stringers or increasing the size, if their renewal is required, the safe loading of the bridge can be increased considerably. Such renewals are also best made with treated material.

Asphalt Planking Economical and Effective

By Engineer of Standards

I assume that the question refers to a wearing surface which can be placed over a wooden floor. We have used two methods, both of which have given satisfactory results. The first method is to install a wearing surface of asphalt plank, which is fastened to the wooden floor by means of nails. Asphalt planking is produced by several manufacturers who market it under different trade names, but, in general, it consists of waste cuttings from prepared roofing which are mixed with asphalt and filled with grit and formed into planks of various widths and lengths.

The second method is somewhat more elaborate. In this case expanded metal is fastened firmly to the wood floor by means of staples. Upon this a layer of asphalt, 1½ in. or 2 in. thick, depending on the amount of traffic, is applied hot and rolled to a proper surface, the material and methods being the same as for ordinary asphalt paving.

A Concrete Floor Is Being Tested

By A. N. Laird
Bridge Engineer, Grand Trunk Western, Detroit, Mich.

In general, we still use the wood plank floor for our lighter wood structures, laying the plank diagonally. These bridges, however, usually serve highways of relatively light traffic, so that a careful study of wearing surfaces has not been deemed necessary. Recently, a creosoted timber bridge was installed on a highway carrying a heavier traffic, and in this case the wearing surface consists of a steel grating spiked

to the stringers and filled with concrete to a depth of ¼ in. over the top of the grating. Close observation indicates that it is giving satisfactory service, although it has not been in use for a sufficient length of time to indicate what the ultimate result will be.

Protecting Snow Sweepers

What precautions should be taken to protect trackmen against injury by trains when sweeping snow during a storm?

Intelligent Supervision Essential

By J. J. Desmond
Division Engineer, Illinois Central, Chicago

The safety of track forces during periods of storm depends in large measure on local conditions, such as clearances, the intricacy of the track layout, the density and character of the traffic and the severity of the storm. In order to provide the best protection for the men, particularly around interlocking plants, it is desirable to select foremen who are thoroughly familiar with the layout and traffic routes and, where possible, to use regular workmen from the section upon which the interlocking plant is located. Careful judgment in making this selection is of the greatest importance.

During long-continued storms, when it becomes necessary, for the relief of the regular forces, to use men for sweeping the snow who are not familiar with the layout, the gangs should be divided into smaller units and placed in charge of experienced foremen who are familiar with all of the conditions surrounding the place of their assignment.

When men are engaged in snow-cleaning, they are usually dressed heavily and frequently have their ears covered; the footing is generally insecure owing to the accumulation of snow; and the wind and driven snow affect their vision; all of which materially increases the hazard of personal injury. For these reasons, skillful supervision and vigilant watchfulness, particularly where inexperienced men are employed, is demanded, if adequate protection is to be provided.

We consider the use of police whistles by the foreman of advantage in warning of approaching trains. By means of a simple and easily understood code, the men can be warned of the direction and route of an approaching train in sufficient time to get in the clear before it arrives.

Close Supervision Is Required

By E. D. Swift
Engineer Maintenance of Way, The Belt Railway of Chicago, Chicago

Well laid plans should be made in advance of the snow season. Foremen, and men who are to be used as temporary foremen, should be taken over their respective territories and the peculiarities of the track layouts, hazardous features, etc., explained to them in detail.

At times, owing to labor scarcity or recruiting difficulties, there is a temptation to work the men an excessive number of hours. Fatigue is a prominent contributing cause of personal injury, and should be taken into consideration and plans made for regular relief. The spirit and physical vigor of the men should be considered by feeding them at regular intervals. Furthermore, at especially difficult assignments and in particularly bad weather, an issue of hot coffee between meals tends to keep the men mentally and physically alert.

Warning signals, given by shouting, the use of whistles or other methods that may be easily understood by inexperienced men should be devised. To the extent possible, night work in actually keeping the tracks open through interlockers, on ladder tracks, and comparable layouts, should be performed by a relatively small force of men who are thoroughly familiar with their surroundings and duties, leaving to a larger day force the heavier work of cleaning up and snow removal.

Inexperienced men, especially when employed in relatively large numbers, are always a problem, and the risk of personal injury to them is greater than it is to regular employees. They should be given the best possible supervision, even to the extent of taking regular foremen away from their own gangs for this purpose.

It is probable that safety, as well as efficiency, in any snowstorm will hinge more largely on good advance planning than on any line of action that can be inaugurated while a storm is in progress. The importance of such planning becomes plain when it is realized that a snowstorm calls for action radically different in many ways from ordinary work, and that the need for action frequently comes suddenly and in large volume.

Detecting Leaks in Water Lines

What is the best method of detecting leaks in underground water lines?

Leaks Can Usually Be Located Easily

By F. H. Kornfeld
Assistant Engineer of Water Supply, Louisville & Nashville, Louisville, Ky.

Only three instances of leaking pipes have occurred in pipes at water stations under my supervision where water did not appear on the surface of the ground. Two of these were detected by noting the increase in daily meter readings during periods when the quantity of water which was being used was known to be less than normal. The third was detected and located by noting a peculiarity in the hydraulic gradient of a pipe while making measurements in an attempt to determine the loss of head in an old pipe. As the leaking pipes were not parts of multiple pipe systems, and as all water entering these pipes was used at practically one point in each case, the location of the leaks was simple.

In one instance, pressure on the pipe was maintained with all service valves closed. Gage readings of pressure at the ends and two intermediate points, approximately at the third points in the length of the pipe, determined a hydraulic gradient which indicated the approximate location of the leak. Casual examination then disclosed that the leak was in the bed of a small stream.

In another instance, pumping and delivery of water was maintained through a pipe that was comparatively new. The average velocity was determined at various points by means of pitot tubes and compared with the theoretical velocity produced by the rate of pumping indicated by the graphic meter. Subsequent measurements definitely located the leak in a section of the pipe sufficiently short to warrant the expense of excavation along the section. This method

is definite and certain, and is applicable to multiple pipe systems and to the detection and location of leaks, regardless of their number. Multiple pipe systems, however, require two simultaneous determinations of the velocity of the water by means of the pitot tube.

In ordinary soils, leaks are usually indicated by the wet surface of the ground near the leak, even when the quantity of water escaping is quite small. Only when water can escape through some hidden channel does it become necessary to adopt means other than policing the route of the pipe in order to detect and locate leaks.

Several Methods Are Described

By J. A. Russell
Engineer of Water Service, Pennsylvania, Philadelphia, Pa.

Our practice in all cases is to make a surface examination of the territory involved. Unless the leakage reaches a sewer or some other subsurface drainage, water will appear on the surface of the ground adjacent to the leak. We have repeatedly detected leakage by investigating the cause of continuously moist areas, even though these were of only slight extent.

We also make use of the meter on the service connection for the district as a detector. Under this plan, the meter is studied closely for 30-min. periods at different hours on successive days. Where possible, different sections of the distribution system are shut off by line valves during the test periods. A careful study of the records obtained on such tests of service meters will be most interesting and instructive.

Where no service meter is available, we make use of a portable test meter and also of the barrel test. In the former test, a one-inch by-pass line, complete with a one-inch meter, is thrown around the valve controlling the supply through the line to be tested. The valve is then closed and all known demands are shut off for 10 or 15-min. periods, during which the action of the meter is observed. In the latter test, a barrel is filled with water and placed adjacent to a faucet or other connection to the line under test. A hose is run from the faucet into the barrel. The line valves on the section under test are then closed, and if there is a leak in this line, water will usually be drawn from the barrel into the pipe line by syphonic action.

For testing pipe lines under rivers or other water courses, we isolate the section by closing line valves on each end and pump air into the pipe line. If there is any leakage, the air will bubble to the surface directly over the leak.

We also make extensive use of pitometers and leak detectors. Using pitometers, we determine accurately the flow into and out of the various sections of the distribution system without seriously interfering with the service for the general district. With all side connections closed off for short periods in the section under test, but with line valves wide open, there should be no difference in the flow into and out of the section. Where a difference does exist, it is undoubtedly due to leakage.

W. B. McCaleb, general superintendent of water service of the Pennsylvania, discussed methods of locating lost pipe lines on page 224 of the May, 1929, issue. The apparatus used for this work is adapted for use in leak detection, and a careful reading of his contribution is recommended. When applied to leak detection work, a pick-up device, in combination with a stethoscope, is connected by a flexible cord to a powerful portable amplifier, and to this amplifier is connected a set of head phones that are worn by the operator. Actual contact is made with the pipe line at regular intervals, varying from 12 to 25 ft. No difficulty is experienced in differentiating between the vibrations due to normal flow through the pipe line and the vibration due to leakage, and one is never in doubt as to when he is directly over a leak. Contact with the pipe line is made through rods of tool steel, ¾ in. in diameter, having one end pointed and tempered.

The use of manometers and the electrical devices requires special equipment and a trained personnel. On most railroads, however, this expense is warranted. Our experience indicates the necessity of such a corps, which should be charged with regular periodic examination of all water supply facilities. It is interesting to note that we have yet to make a large survey where the expense has not been more than warranted, considering the resulting savings.

The Purpose of Spring Washers

What is the purpose of a nut lock or spring washer? Does their use improve the condition of the joint, and if so, why?

The Term "Nut Lock" Is a Misnomer

By Engineer Maintenance of Way

The term nut lock is somewhat misleading and is generally being superseded by the terms spring washer or joint spring, which more nearly describes the function of this device, since the locking or holding of the nut to prevent its backward movement on the bolt is only incidental to the duty it is designed to perform. The primary purpose of a spring washer when used on a track bolt is to exert a continuous pressure parallel to the axis of the bolt, sufficient to prevent looseness which may result from wear of the rail, the joint or the bolt; from stretch in the bolt; or from corrosion, or any other form of deterioration, in the several parts of the joint.

Spring washers of the types in general use on rail joints are designed to exert high pressure between the nut and the joint fastening, so as to equalize the tension in the bolts which hold the joint assembly together; to absorb so far as possible the shocks of the moving loads; and to compensate for any wear that may occur in the various parts of the joint.

As a matter of fact, if the nut on a track bolt is kept tight, it seldom shows any tendency to back up. Where this does occur, it is usually found that the bolts have been allowed to get loose from other causes before this action took place. Before heat-treated and special-steel bolts came into use, stretching was the most common cause of loose bolts. Owing to the greater strength of the bolts now in use, such elongation now rarely occurs. This high-strength characteristic of present-day bolts has introduced another problem in track maintenance, however, since, if spring washers are not used, the joint bars may be wedged so tightly into the fishing spaces of the rails as to prevent movement of the rail in the joint under expansion and contraction. In hot weather this results in "sun kinks," which may be of sufficient magnitude to derail a train. During low temperatures, tension may be developed sufficient to

shear the bolts in some joint which is not so tightly bolted, opening a rail gap that may be dangerous. Spring washers and joint springs, when properly used, allow the joint to function properly in carrying the passing loads, provide for proper expansion and contraction of the rails, increase safety and improve the riding quality of the track.

Spring Washers Reduce Maintenance

By P. O. Ferris
Assistant Engineer Maintenance of Way, Delaware & Hudson, Albany, N. Y.

The purpose of the nut lock, spring washer or rail spring, as a track appliance, is to reduce maintenance on switches, frogs and rail joints. Were it not for the fact that they perform this function, they would not have been adopted for use on the railroad with which I am connected. Before adopting them, considerable trouble was experienced with loose bolts, and only by constant inspection and maintenance, were our forces able to keep our bolts tight.

Since they have been in use, our troubles have been greatly diminished. We get a very uniform tightening of the bolts, while re-tightening is possible, because the battering of threads at the bolt holes has been eliminated, and a "frozen nut" is rare.

We oil our track joints periodically. The spring washers, in conjunction with the oil, save us hours of labor in unstrapping rail for a relaying job, and are surely appreciated by the track walker, whose duty it is to replace broken angle bars.

Through the use of these appliances, we obtain flexibility of joints, permitting rail expansion and contraction, which is especially important since our change from 33-ft. to 39-ft. rails. This in turn results in less rail batter, fewer low joints and longer life of rail.

Best Type of Roofing

What is the best type of roofing for frame stations in small cities from the standpoint of maintenance and appearance?

Slate or Asbestos Is Preferred

By J. W. Orrock
Engineer of Buildings, Canadian Pacific, Montreal, Que.

In my opinion, genuine slate or asbestos roofing is the choice for such stations as are indicated in the question, but if these are too expensive or not suitable, asphalt, slate-surfaced shingles or wood shingles are further choices, any one of which I consider satisfactory.

Several Types of Roofing Are Satisfactory

By General Inspector of Buildings

There are several types of roofing that are adapted for use on frame stations in small cities, all of which present a satisfactory appearance and reduce maintenance to a minimum. If the roof has sufficient strength or can be reinforced to carry the load, slate can be used to advantage. This form of roofing gives a good appearance on practically any design of frame station in use on the railways, while it requires little maintenance, if it is of good quality and has been applied properly. If a somewhat lighter roofing is desired, asbestos shingles can be used, as they have a long service life and the maintenance requirements are about the same as for slate. Asbestos shingles have an added advantage in that they can be obtained in sizes, shapes and colors which permit a wide range of choice in roof effects. Both slate and asbestos shingles have a high fire resistance and for this reason materially decrease the fire hazard in frame stations. If the roof is of such a character, however, that these heavier shingles cannot be used, there are numerous grades, weights and colors of asphalt shingles on the market, which can be used in a variety of patterns, and which are satisfactory from the standpoints of appearance and maintenance, while the cost of installing this type of shingles is less than for slate or asbestos. Building maintenance officers have, therefore, a wide range of roofing materials, which are adapted for use under the conditions set forth in the question, from which they can choose the particular product that most nearly meets the requirements of the special problem they are considering.

Asphalt Shingles Are Satisfactory

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

The standard on the Rock Island, which I consider satisfactory, is an individual asphalt shingle laid about 4½ in. to the weather. I cannot give an estimate of the service life that we may expect from such shingles as none of those in use has failed so far, but I presume it will be at least 15 years. The life depends very largely upon the character of the shingles that are used, whether of sufficient weight, saturation and surface covering. We have, in the past, purchased some lighter weight asphalt shingles than we should, and they have given some trouble, especially in the Southwest, where we experience extended seasons of dry hot weather with frequent strong winds. Our trouble here was due to the inadequate thickness or weight of the shingles we were using, since they were not strong enough to keep the wind from lifting the exposed end of the shingle and, in some instances, this action continued until the shingle broke off.

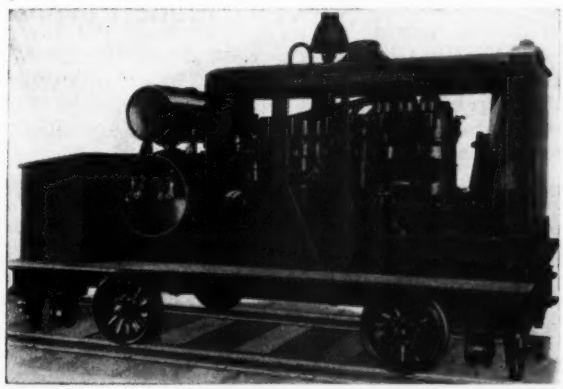
In order to rectify this condition, we now put a little dab of asphalt roof coating underneath the two corners of the exposed ends of the shingles when laying them. This keeps the corners down and apparently has overcome this difficulty.

The West Coast lumber interests have recently developed a new idea in the use of wood shingles. The use of clear cedar shingles has been decreasing from year to year, owing to the fire hazard they present, until at present their use by railways is negligible. In order to regain this market, a process has been developed, whereby the cedar shingles are given a coating of colored asphalt, in which crushed slate or granite is embedded. In my opinion, this process should result in the re-establishment of the cedar shingle as a roofing material for station use. These shingles are being made with ½-in. butts and, when covered with the slate or stone, should meet the Underwriters' requirements, although I am not certain that they have as yet been given final approval. Shingles with ½-in. butts will present a much better appearance than the ordinary asphalt shingle, which is from ⅛ in. to $\frac{3}{16}$ in. thick. They also give better roof lines and, since they come in random widths, this also adds to their appearance. A serious objection to the asphalt shingle is that it is too uniform in size and texture and therefore does not give sufficient character to a roof.

New And Improved Devices

Supercharger Increases Efficiency of Compressor

THE Independent Pneumatic Tool Company, Chicago, is introducing its Thor Six air compressor, mounted on a rail car and having, as an important feature, a supercharger which enables the piston on its downward or idle stroke to deliver additional air to the cylinder. The supercharger is a device incorporated in the air cylinder, which is said to add 26 per cent to the delivery volume and to give the unit a volumetric efficiency of 80 per cent. It consists of an annular space at the lower end of the air cylinder in which air is compressed on the down stroke by the lower side of the trunk piston. This air is



The Thor Six Air Compressor Mounted on a Rail Car

delivered to the cylinder, which has already been filled by air drawn in through the intake valves at the bottom of the main piston stroke, by means of a flash port. It is said that this air from the supercharger increases the quantity of air in the air cylinder by 25 per cent, raises the cylinder pressure to approximately five pounds per square inch gage pressure before the compressing stroke begins and snaps the inlet valves shut instantly. It is also said that the extra power required is not in direct proportion to the added delivery as the air is compressed on what is normally the idle stroke of the piston. The only extra parts required are an additional intake valve for each cylinder, which can be removed, leaving the compressor to operate at the normal efficiency of a standard machine.

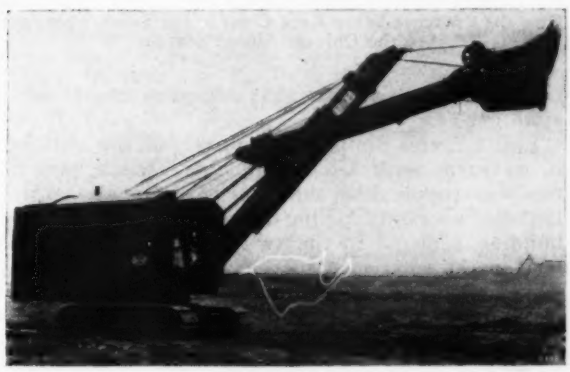
The compressor is direct-driven from the four-cylinder gasoline engine, both being mounted on a single crank case; hence there are no gears or couplings, or a clutch. The machine is furnished in either self-propelled or non-self-propelled types. The rail car is equipped with transverse caster wheels and jacks to facilitate the removal of the unit from the track. A large tool box, running boards, lifting bail and drawbar attachment are provided. The axles are of alloy steel and have Timken roller bearings. The steel wheels are equipped with the M.C.B. standard flange and are of the disc type.

These compressors are manufactured in two sizes, the small size having a rating of 116 cu. ft. of free air per min. and the large size a rating of 250 cu. ft.

Some New Excavators

IN ADDITION to its regular line of excavators, the Harnischfeger Corporation, Milwaukee, Wis., has announced seven new models, by the addition of which the excavators manufactured by this company now range in capacity from ½ to 3½ cu. yd. The new models are known as the 600-A, 1 cu. yd.; the 650, 1¼ cu. yd.; the 700-A, 1¼ cu. yd. rock shovel; the 750, 1½ cu. yd.; the 775, 1½ cu. yd. long corduroy model; the 800, 2½ cu. yd., and the 900, 3½ cu. yd.

Models 600-A, 650, 700-A and 750 may be equipped as shovels, draglines, cranes, clamshells, trench-hoes, skimmer scoops or pile drivers, while Models 800 and 900 may be used only as shovels, draglines or clamshell-cranes. Because of its long corduroy traction,



The Model 700-A Shovel of 1½ cu. yd. Capacity

the Model 775 is equipped for dragline, clamshell-crane or trench-hoe only.

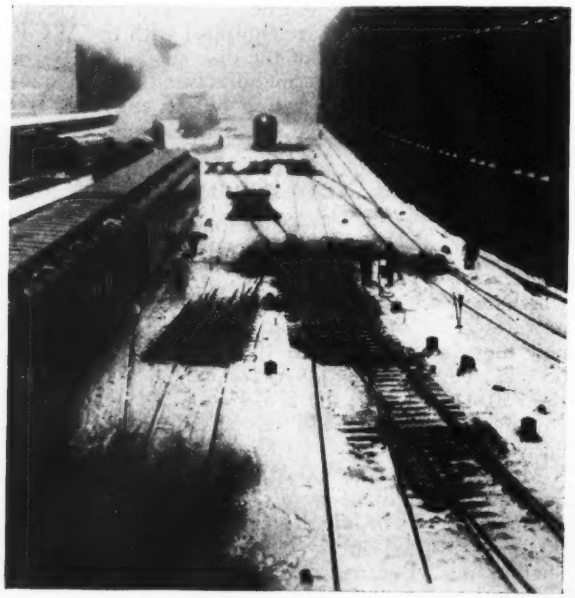
This line of excavators incorporates a number of improvements which were adopted as a result of field tests. They include new internal expanding wing clutches; improved clutch and brake-bands of longer life; a stronger "fish belly" type of shovel boom with larger cable sheaves; an easily operated dipper trip, and shock-absorbing springs on the power clutch. Furthermore, all machines can be equipped with the

newest type full Diesel motors, fully enclosed and dust-proof.

In addition to these improvements, the new models include all other features common to P & H construction, such as unit cast-steel main frames, positive independent chain-crowd and the use of a large number of alloy-steel parts.

Gas Burners Keep Switches Open

THE TIE-UP of railway traffic, due in part to the clogging of switches with snow and ice, which occurred at Chicago and vicinity during the blizzard of December 18-19, has demonstrated the need for more effective equipment in combating this trouble, and the successful use of gas burners by the Chicago



How the Switches Were Kept Clear in the South Approach to the Chicago Union Station

Union Station Company has attracted considerable attention.

Last fall, this company equipped four slip switches in its yards with 376 Vaughn gas switch burners. Gas was supplied by the local gas company, which laid the necessary piping and set up a meter in a building adjacent to the switches. The piping was laid on the surface in such a way as to permit any condensation to drain to a trap near the outlet of the meter. During the 40-hr. period of the storm the switches equipped with heaters required no attention to prevent them from becoming clogged with snow and ice. It is said that the rails, being heated before the snow accumulates, melt it as it falls, resulting in clean throats at all times.

The heaters are furnished in units of two burners, one at each rail and connected by a small pipe that is insulated to prevent interference with the track circuit. Adjoining units are connected at one end by a short piece of flexible hose. Each unit is attached to the rails by one of two sets of spring clamps, each set consisting of a clamp for each rail. One set fixes the burner to the rails at all places except at the knuckles of movable-point frogs with "easer" rails, where the other set is utilized. A unit is placed in each tie space and clamped to the rails by springing back the jaws. Heat is applied directly under the bases of switch and stock rails, the burners being located between the bases of switch and stock rails with the switch open.

The gas is turned on at a central point and the burners are lighted by a torch with a long handle. Tests indicate that the flames can not be extinguished by a wind having a velocity of 45 miles an hour. It is said that the metal of the switch is not adversely effected, as the temperature seldom exceeds 125 deg. F., during stormy weather. During the blizzard in December, the 376 burners had a maximum demand of 6,000 cu. ft. of gas per hour, or 1,500 cu. ft. per hr. for each No. 8 double-slip switch. However, the average consumption of the installation for efficient operation is considerably less than the maximum demand.

From data obtained during nine days in which the burners were in operation and figuring on the basis of the cost of gas in Chicago, a single burner uses 12 cu. ft. of gas per hour and a double-slip switch, approximately 1,000 cu. ft. per hr., giving a cost of approximately $0.76 per hr. for each double-slip switch. These gas heaters are manufactured and sold by the Ruby Railway Equipment Company, Philadelphia, Pa.

Tie Tamper Power Plant Serves Unique Purpose

A SYNTRON 12-tool electric tie tamper power plant, manufactured by the Syntron Company, Pittsburgh, Pa., has been converted by a mid-western road into an emergency auxiliary source of power for the operation of an inter-locking plant.

Interior View of the Power House, Showing the Auxiliary Plant at the Left

The power plant consists of a 45-hp. gasoline engine, direct-connected to a 20-kw, 3-phase, alternating current generator which produces power identical to that secured from the power company. To secure it firmly, this assembly is mounted on and bolted to a concrete foundation. A starting motor is provided to furnish quick and easy starting, and a switchboard panel and voltage regulator were furnished and installed by the Syntron Company.

In the event of failure of the main power supply, the operator presses the starter button on the engine and throws the main control switch from the power line to the auxiliary supply.

WITH THE ASSOCIATIONS

Metropolitan Track Supervisors' Club

The next meeting of the Metropolitan Track Supervisors' Club will be held on February 13 at Keen's Chop House, 72 West Thirty-sixth street, New York City. Luncheon, which will be served at 12:30 p. m., will be followed by the regular business meeting, at which the principal subject under discussion will be: "Are Trackwalkers a Present Day Necessity?"

Maintenance of Way Club of Chicago

The January meeting was held at the Auditorium hotel on January 22 with 67 members and guests present. B. T. Gibbs, Jr., works manager, Morden Frog & Crossing Works, Chicago Heights, Ill., spoke on the progress that has been made in the design and improvements that have been made in the manufacture of special trackwork, through the agency of the Track committee of the A. R. E. A., in co-operation with the Manganese Track Society. C. W. Breed, engineer of standards, Chicago, Burlington & Quincy, Chicago, read a paper in which he reviewed the history of railway track with particular reference to the development of special trackwork.

The next meeting will be held February 19, when D. C. Curtis, chief purchasing officer, Chicago, Milwaukee, St. Paul & Pacific, will discuss track scrap, his subject being: "Are Trackmen Wasters?"

American Railway Engineering Association

Following the precedent established last year, the selection of the committee personnel and the assignment of subjects was completed in time for printing and distribution to the members early in January. A number of committees have taken advantage of this opportunity to start their work for the ensuing year in advance of the March convention. Four committees have already held meetings, several others have meetings scheduled for the next few weeks, while still others are arranging for early meetings.

The Committee on Yards and Terminals, whose assignment includes recommendations for design of airports over or in connection with railway yards, met at Akron, Ohio, on January 20, and inspected the Goodyear airport at that point; the Track committee met at St. Louis, Mo., on January 21; the Committee on Iron and Steel Structures met at Cleveland, Ohio, on January 23 and 24; and the Committee on Economics of Railway Location held a meeting at Pittsburgh, Pa., on January 24.

All committees have completed the reports which are to be presented at the convention, which is to be held at Chicago from March 11 to 13, inclusive. These reports require the publication of six bulletins, four of which, Nos. 319 to 322 inclusive, have already been mailed to the members of the association; Bulletin 323 will be placed in the mails the first week in February; and Bulletin 324, containing the remainder of the reports, is now in the printer's hands and will be issued shortly. The reports this year embrace about 1,500 pages of printed matter, in addition to numerous drawings and charts, the reports of the Rail committee and of the Special Committee on Stresses in Track requiring the greatest amount of space.

The Committee on Arrangements met in January and, as a result, was able to send out on January 20, notices of the thirty-first annual dinner, which is to be held in the Grand Ballroom of the Palmer House on Wednesday evening, March 12. Arrangements have been made to accommodate ladies in the balcony, and a number of tables have been set aside for their use. A large number of reservations have already been made, and it is expected that the entire number of tickets available will be sold in advance of the convention.

Roadmasters Association

The executive committee held a meeting at the Hotel Stevens, Chicago, on December 7, at which the personnel of the committees was selected, which are to investigate and report at the next convention on the subjects selected at the last annual meeting, as follows:

The Equation of Track Mileage as a Basis for the Distribution of Forces: P. J. McAndrews, chairman, roadmaster, C. & N. W., Sterling, Ill.; C. E. Anderson, roadmaster, C. B. & Q., Burlington, Iowa; H. B. Bachrach, supervisor, D. & H., Schenectady, N. Y.; N. M. Gamble, roadmaster, S. A. L., Savannah, Ga.; B. E. Haley, general roadmaster, A. C. L., Lakeland, Fla.; W. S. Hofford, roadmaster's clerk, L. A. & S. L., Los Angeles, Cal.; F. H. Masters, assistant engineer, E. J. & E., Joliet, Ill.; T. P. O'Neill, engineer maintenance of way, C. & S., Denver, Colo.; H. A. Powell, office engineer, Central Indiana, Anderson, Ind.; Robert Yost, roadmaster, A. T. & S. F., Chillicothe, Ill.

Getting the Most from Labor Saving Equipment: W. O. Frame, chairman, district engineer maintenance, C. B. & Q., Burlington, Iowa; W. M. Anderson, roadmaster, S. A. L., Birmingham, Ala.; John Clutz, supervisor, Penna., Clayton, Del.; C. H. R. Howe, cost engineer, C. & O., Richmond, Va.; A. A. Johnson, engineer of track, D. L. & W., Hoboken, N. J.; W. H. Jones, roadmaster, A. T. & S. F., Chillicothe, Ill.; D. E. Lynch, roadmaster, C. B. & Q., Sheridan, Wyo.; Z. L. Mobley, roadmaster, Southern, Alexandria, Va.; J. R. Perkins, roadmaster, C. R. I. & P., Sibley, Iowa; W. L. Shanks, supervisor, B. & M., North Adams, Mass.

The Division of Work Between Section and Extra Gangs: R. L. Sims, chairman, district engineer maintenance of way, C. B. & Q., Galesburg, Ill.; W. J. Daehn, roadmaster, C. & N. W., Sparta, Wis.; G. T. Donahoe, assistant division engineer, N. Y. C., Rochester, N. Y.; William Hogan, supervisor, B. & O. C. T., Chicago; C. H. Higgins, roadmaster, Maine Cen., Bartlett, N. H.; F. J. Liston, roadmaster, C. P. R., Montreal, Que., H. P. Stafford, assistant general roadmaster, D. S. S. & A., Marquette, Mich.; William Shea, assistant engineer maintenance of way, C. M. St. P. & P., Chicago; W. H. Sparks, general inspector of track, C. & O., Russell, Ky.; I. D. Talmadge, roadmaster, N. Y. O. & W., Middletown, N. Y.; D. Wagner, roadmaster, Mich. Cen., St. Thomas, Ont.

The Use of Motor Trucks in Track Work: O. J. Surprenant, chairman, roadmaster, D. & H., Schenectady, N. Y.; C. F. Allen, division engineer, C. M. St. P. & P., Milwaukee, Wis.; G. G. Austin, general roadmaster, C. J., Chicago; John Barth, supervisor, C. C. C. & St. L., Mattoon, Ill.; W. A. Clark, supervisor, Reading, Trenton, Jct., N. J.; W. E. Carter, supervisor, B. & L. E., Greenville, Pa.; C. F. Edwards, assistant cost engineer, C. & O., Huntington, W. Va.; J. O. Heap, supervisor on special duty, Penna., Baltimore, Md.; R. Keesler, assistant engineer, Union Traction Co., Anderson, Ind.; P. F. Maisenbacher, roadmaster, E. J. & E., Gary, Ind.; John O'Leary, roadmaster, G. N., Minneapolis, Minn.; H. G. Watkins, engineer maintenance of way, A. C. & Y., Akron, Ohio.

Recent Developments in Roadbed Drainage with Particular Reference to Multiple Tracks and Yards: J. A. Snyder, chairman, division engineer, Mich. Cen., Detroit, Mich.; O. Anderson, roadmaster, L. A. & S. L., Los Angeles, Cal.; A. B. Chaney, division engineer, M. P., McGehee, Ark.; C. A. Geiger, supervisor of track, N. Y. C., Toledo, Ohio; H. H. Hann, roadmaster, N. Y. O. & W., Walton, N. Y.; P. J. Hurlihe,

track supervisor, N. Y. N. H. & H., Danbury, Conn.; C. M. Hayes, assistant general roadmaster, M. St. P. & S. Ste. M., Minneapolis, Minn.; A. L. Kleine, roadmaster, A. T. & S. F., Marceline, Mo.; C. T. Kimbrough, general roadmaster, I. H. B., Calumet City, Ill.; Charles Kratoska, roadmaster, C. & N. W., Ames, Iowa.

Bridge and Building Association

The personnel of the committees, which are to study and prepare reports on the subjects adopted for presentation at the convention in October, were selected by the executive committee at its meeting in Chicago on December 14. The subjects assigned for study and report, together with the personnel of these committees, are as follows:

Masonry Failures—Their Causes and Remedies: A. B. Scowden (chairman), general bridge inspector, B. & O., Cincinnati, Ohio; L. A. Gillett, structural engineer, F. E. C., St. Augustine, Fla.; E. Cahill, general foreman bridges and buildings, D. L. & W., Scranton, Pa.; I. L. Simmons, bridge engineer, C. R. I. & P., Chicago; A. C. Irwin, manager, railways bureau, Portland Cement Association, Chicago; W. A. Batey, inspector, U. P., Omaha, Neb.; C. D. Turley, assistant engineer, I. C., Chicago; G. W. Sawyer, supervisor masons, D. & H., Oneonta, N. Y.; and H. C. Swartz, superintendent bridges and buildings, C. N. R., Montreal, Que.

The Relative Advantages and Costs of Precast Concrete Crib Walls and Monolithic Walls: T. H. Strate (chairman), engineer track elevation, C. M. St. P. & P., Chicago; A. I. Gauthier, supervisor bridges and buildings, B. & M., Concord, N. H.; W. G. Swartz, engineering accountant, C. N. R., Montreal, Que.; Van S. Brokaw, assistant engineer, C. M. St. P. & P., Chicago; C. L. Marks, assistant supervisor bridges and buildings, C. & O., Richmond, Va.; W. R. Roof, bridge engineer, C. G. W., Chicago; T. E. O'Brien, bridge and building master, D. & H., Carbondale, Pa.; H. I. Benjamin, assistant bridge engineer, S. P., San Francisco, Cal.; E. E. R. Tratman, editor, Engineering News-Record, Chicago; and T. W. Pinard, engineer bridges and buildings, Penna., New York.

Programming Bridge, Building and Water Service Work: E. C. Neville (chairman), bridge and building master, C. N. R., Toronto, Ont.; H. H. Best, supervisor bridges and buildings, M. P., Little Rock, Ark.; H. C. Munson, division engineer, C. M. St. P. & P., Sioux City, Iowa; W. A. Hutcheson, assistant supervisor bridges and buildings, C. & O., Clifton Forge, Va.; R. J. Black, assistant engineer buildings, P. M., Saginaw, Mich.; G. S. Crites, division engineer, B. & O., Baltimore, Md.; D. C. Barrett, division engineer, C. & N. W., Winona, Minn.; J. P. Yates, supervisor bridges and buildings, G. C. L., De Quincy, La.; V. E. Engman, chief carpenter, C. M. St. P. & P., Terre Haute, Ind.; and A. L. McCloy, supervisor bridges and buildings, P. M., Saginaw, Mich.

The Use of Power Tools and Equipment in Bridge and Building Work: R. D. Ransom (chairman), supervisor bridges and buildings, C. & N. W., Sioux City, Iowa; E. E. Candee, supervisor bridges and buildings, N. Y., N. H. & H., New Haven, Conn.; Arthur Sweet, general foreman bridges and buildings, A. T. & S. F., Newton, Kan.; J. B. Livingston, supervisor bridges and buildings, S. L. S. W., Jonesboro, Ark.; C. W. Boyce, supervisor bridges and buildings, Y. & M. V., Vicksburg, Miss.; Sam Lincoln, general foreman bridges and buildings, G. C. & S. F., Beaumont, Tex.; J. F. Lockwood, supervisor bridge erection, C. & O., Richmond, Va.; and J. P. Hofacker, supervisor bridges and buildings, L. V., Auburn, N. Y.

Camp Cars and Their Equipment for Bridge and Building Crews: C. M. Burpee (chairman), bridge and building master, D. & H., Albany, N. Y.; G. M. Haley, supervisor bridges and buildings, U. P., Salt Lake City, Utah; L. G. Byrd, supervisor bridges and buildings, M. P., Wynne, Ark.; E. L. Hawkins, inspector bridges and buildings, S. P., Houston, Tex.; E. M. McCabe, supervisor bridges and buildings, B. & A., Pittsfield, Mass.; T. E. Snyder, supervisor bridges and buildings, B. R. & P., East Salamanca, N. Y.; Charles Harrison, Muskogee, Okla.; H. Heiszenbuttel, supervisor bridges and buildings, C. & N. W., Norfolk, Neb.; W. A. Stewart, assistant supervisor bridges and buildings, C. Vt., New London, Conn.; and H. Cunniff, general foreman painters, D. & H., Cohoes, N. Y.

The Inspection and Maintenance of Water Tanks and Their Appurtenances: E. H. Brown (chairman), supervisor bridges and buildings, N. P., Minneapolis, Minn.; F. M. Case, supervisor water service, C. & N. W., Sioux City, Ia.; F. P. Farrell, supervisor water service, M. P., Pueblo, Colo.; W. E. Pierce, supervisor water service, D. & H., Oneonta, N. Y.; R. C. Bardwell, superintendent water service, C. & O., Richmond, Va.; J. H. Bugg, supervisor water service, C. N. R., London, Ont.; W. R. Fithian, assistant engineer, M. P., Osawatomie, Kan.; C. R. Knowles, superintendent water service, I. C. Chicago; and E. A. LeWald, engineering inspector, G. C. & S. F., Galveston, Tex.

The Modernizing of Station Buildings: F. H. Soothill (chairman), building department, I. C., Chicago; A. J. Hayes, field supervisor bridges and buildings, C. B. & Q., Chicago; T. D. McMahon, architect, G. N., St. Paul, Minn.; F. T. Stafford, draftsman, G. C. & S. F., Galveston, Tex.; Kemper Peabody, superintendent buildings, N. Y. C., New York; C. W. Wright, master carpenter, L. I., Jamaica, N. Y.; F. M. Lehrman, draftsman, C. & N. W., Chicago; A. O. Lagerstrom, architect, C. M. St. P. & P., Chicago; A. B. Nies, assistant engineer buildings, M. C., Jackson, Mich.

The Maintenance of Turntable and Drawbridge Machinery: A. E. Bechtelheimer (chairman), assistant bridge engineer, C. & N. W., Chicago; C. A. J. Richards, assistant engineer, Penna., Chicago; J. J. Wishart, supervisor bridges and buildings, N. Y., N. H. & H., Boston, Mass.; H. A. Gerst, assistant bridge engineer, G. N., Spokane, Wash.; L. B. Alexander, assistant bridge engineer, M. C., Detroit, Mich.; W. V. Parker, foreman bridges and buildings, S. L. S. W., Paragould, Ark.; R. W. Johnson, assistant engineer, C. M. St. P. & P., Chicago; B. M. Whitehouse, assistant general bridge inspector, C. & N. W., Chicago; and H. H. Ueckert, supervisor structures, S. P., Houston, Tex.

Directory of Associations

American Railway Bridge and Building Association—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 21-23, 1930, Louisville, Ky.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 11-13, 1930, Palmer House, Chicago.

American Wood-Preservers' Association, H. L. Dawson, secretary, 228 North LaSalle street, Chicago. Next convention, January 27-29, 1931, Philadelphia, Pa.

Bridge and Building Supply Men's Association—W. H. Lawrence, secretary, Johns-Manville Corporation, 41st street and Madison avenue, New York. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers—Roy M. Edmonds, secretary, Syndicate Trust Building, St. Louis, Mo. Next convention, April 29-May 1, 1930, Memphis, Tenn.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 16-18, 1930, Chicago.

Track Supply Association—L. C. Ryan, secretary, Oxweld Railroad Service Company, Chicago. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Railway Industry at a Glance

Operating revenues and expenses of the Class I steam railways in the United States, from data compiled by the Bureau of Statistics, Interstate Commerce Commission

	Month of November			11 Months Ending with November		
	1929	1928	Decrease 1929 Under 1928, per cent	1929	1928	Increase 1929 Over 1928, per cent
Total operating revenues	$499,210,862	$532,085,264	6.2	$5,883,455,082	$5,693,129,623	3.3
Expenditure for maintenance of way and structures	**67,839,061**	**68,792,874**	**1.4**	**802,629,961**	**786,738,207**	**2.0**
Total operating expenses	372,167,148	374,840,821	0.7	4,191,132,256	4,123,698,698	1.6
Net railway operating income	86,669,467	113,555,731	23.7	1,201,336,285	1,099,795,745	9.2

RAILWAY NEWS BRIEFLY TOLD

The Interstate Commerce Commission, on January 16, made public a decision finding the Baltimore & Ohio to have violated the Clayton anti-trust act by acquisition of 42.8 per cent of the stock of the Western Maryland, and an order requiring it to divest itself of the stock within six months.

An item of $128,750,000 for inland transportation of mails by railroad routes and mail passenger service is included in the appropriation bill for the Postoffice Department for the fiscal year 1931 as reported by the House appropriations committee. This compares with $129,500,000 estimated by the Budget Bureau and with an appropriation of $126,000,000 for the fiscal year 1930.

A recent compilation showed that there were 20,800 registered holders of Illinois Central stock, 87 per cent of whom owned fewer than 100 shares each. Wyoming is the only state in the Union which is not represented by an Illinois Central stockholder. Illinois heads the list with nearly 6,000. Forty-two per cent of the Illinois Central stockholders in this country reside in the 14 states in which the system operates. Only 680 of the 20,800 are found in foreign countries.

According to a report made to the trustees, 57 sons and daughters of employees of the Boston & Maine have been assisted in their college education in the school year 1929-30 by scholarships from the B. & M. Railroad Employees' Fund. In all, $4,000 was allotted to young men and women in universities, normal schools, business colleges, music schools and other institutions. The fund was created in March, 1928, on the retirement of Homer Loring as chairman of the executive committee, to advance the general welfare of the employees.

The Matson Line, operating steamships between San Francisco, Cal., and Honolulu, is advertising a "boat train" from New York, in which passengers make the transcontinental journey without changing cars. This service was commenced on January 21, when passengers started from New York by the Twentieth Century Limited of the New York Central and the Broadway Limited of the Pennsylvania. From Chicago the route is over the Chicago & North Western, the Union Pacific and the Southern Pacific. The train arrived in San Francisco on the evening of January 24, and the boat left the next day at noon. The schedule time from New York to Honolulu is eight days, or three days less than the time heretofore usually taken for the trip. It is proposed to run the second "boat train" from New York on February 18.

The Interstate Commerce Commission reduced by 280 its docket of formal cases and also materially reuced the time between the filing and the disposal of litigation before it during 1929. When the year opened, there were 2,706 formal rate cases pending and when it closed there were 2,426 cases, this being the smallest number of cases pending at any time since September, 1926. A maximum of 2,852 was reached in November, 1927.

Judge William E. Lee of the Supreme Court of Idaho was nominated as a member of the Interstate Commerce Commission by President Hoover on January 9 to fill out the unexpired term of Johnston B. Campbell, resigned, which runs to December 31, 1931. The Senate Committee on Interstate Commerce voted unanimously on January 15 to report that Judge Lee's appointment should be confirmed. Judge Robert Milton Jones of Tennessee, who was nominated as a member of the commission to succeed R. V. Taylor by President Hoover on December 7, has informed the President that he does not wish to accept the appointment, following the postponement of his confirmation by the Senate.

St. Lawrence Waterway Impractical

The two Canadian engineers, appointed to make a study of the proposed St. Lawrence waterway, have advised strongly against the project. They claim that existing railway facilities will be adequate to handle all traffic for some time to come, in view of the movement of grain through Pacific coast ports, the completion of the Hudson Bay railway and the decrease of the United States grain export trade. They contend, also, that the project would effect a saving of only 2 cents per bushel on grain instead of the estimated savings of from 6 to 10 cents, and that the estimates of construction made by the Joint Board of Engineers in 1926 are too low. They cite the example of the Welland ship canal which was estimated to cost $50,000,000 and has already cost $100,000,000.

The Transcontinental Air Transport has reduced the passenger fare from New York to Los Angeles via the Pennsylvania Railroad, the T.A.T., the Atchison, Topeka & Santa Fe and the T. A. T., to $159.92, a reduction of $108.51 from the former rate and of more than 50 per cent from the rate which was charged when the airplane service was begun in July, 1929. Reductions have also been made in the fares on the T. A. T. routes between all principal cities.

The courses in railway transportation given by William J. Cunningham, James J. Hill Professor of Transportation, Harvard University, and Winthrop M. Daniels, Thomas DeWitt Cuyler Professor of Transportation, Yale University, are again included in the schedule of studies at the special summer session for business executives to be held during July at the Harvard Graduate School of Business Administration. This 1930 session will be the third to be held at Harvard.

The Supreme Court of Colorado on January 20 handed down an opinion reversing the decision of Judge Robert G. Smith of the federal court at Denver, Colo., who ruled on October 6, 1928, that the Moffat Tunnel Commission was within its rights in issuing supplemental bonds to complete the construction of the Moffat Tunnel. The state supreme court has instructed the District Court to issue an injunction restraining the Moffat Tunnel improvement district and the tunnel commission from disposing of any funds realized from the special property tax, levied to pay interest on the bonds, until the case is finally determined.

Circular No. 251 of the Safety Section, A. R. A., which has been issued by E. R. Cott, chairman of the Committee of Education, is devoted to admonitions emphasizing the precautions necessary to be taken in railroad work at this time of the year because of the presence of snow and ice. Among the precautions listed are the following: Prevention of the formation of ice where practicable; the removal of icicles from the eaves of buildings to prevent them from dropping off; care in mounting or dismounting moving trains; the use of short overcoats for freer movement of the limbs, and the use of ice grippers to be worn on shoes when weather conditions require.

Construction News

The Canadian National plans the construction of an addition to its yard at Tecumseh, Ont., involving six to eight yard tracks which will add 500 cars capacity. A contract has been let by this company to the Rayner Construction Company, Toronto, Ont., for the construction of a connection about two miles long with the grain elevator of the Canada Steamship Company at Kingston, Ont., at a total cost of about $100,000.

This company will spend approximately $10,000,000 during the year in connection with the $50,000,000 Montreal terminal plan, most of this amount going toward grade separation by the construction of subways and overhead bridges. Work is also to be continued on the $5,000,000 seven-year program for the improvement of the Point St. Charles shops at Montreal. A contract has been let by this company to the Northern Construction Company and J. W. Stewart for the construction of timber pier sheds at Vancouver, B. C. The total cost of this project is estimated at $900,000.

The Canadian Pacific has let a general contract to Anglin & Norcross for the construction of a 21-story addition to the Royal York hotel at Toronto, Ont., involving an expenditure of $839,500. A contract for the steel work has been let to the Dominion Bridge Company.

The Chesapeake & Ohio has let a contract to Langhorne & Langhorne, Huntington, W. Va., for the construction of a line from Millard, Ky., eastward to the Kentucky-Virginia state line, about 28 miles. The total cost of the extension is estimated at $4,804,000.

The Chicago, Rock Island & Gulf has awarded contracts for constructing a concrete and steel bridge across the Trinity river at Dallas, Tex., to cost $500,000 to Robert Brothers, Chicago, for the grading, and to John W. Fox, El Reno, Okla., for the bridge work.

The Clinton - Oklahoma - Western should be allowed to construct a line between Heaton, Tex., and a point north of the north fork of the Red river, 8.7 miles, according to a proposed report to the Interstate Commerce Commission by Examiner T. F. Sullivan.

The Dayton & Union has awarded a contract for the construction of a track elevation project at Dayton, Ohio, to the M. E. White Company, Chicago, for $435,000.

The Gulf & West Texas has been granted a certificate by the Interstate Commerce Commission, authorizing the construction of a line from Fredericksburg, Tex., to Brady, 69 miles, and from Eden, Tex., to San Angelo, 44 miles, on condition that the certificate shall not become effective as to the line from Eden to San Angelo unless and until the G. & W. T. files an appropriate application and receives authority to operate over the line of the Gulf, Colorado & Santa Fe between Brady and Eden or to construct a new line between Brady and Eden.

The Kansas City Terminal contemplates the construction of a steel and concrete viaduct 58 ft. wide to carry Oak street in Kansas City, Mo., over the terminal tracks, at a cost of about $400,000.

The Oklahoma City-Ada-Atoka has applied to the Interstate Commerce Commission for authority to construct an extension of seven miles southwest from Marion, Okla.

The Pittsburgh & West Virginia has let a contract to the Vang Construction Company, Baltimore, Md., for the construction of the third section of its Connellsville extension. The section covered by this contract extends from the bridge across the Monongahela river at Belle Vernon, Pa., to a point two miles south of Scottdale, Pa., and is to be built at an estimated cost of $4,500,000. Work will be started at once, and will be completed early next July.

The St. Louis, San Francisco & Texas, a subsidiary of the St. Louis-San Francisco should be authorized to construct a line from Vernon, Tex., south to Seymour, 42 miles, according to a recommendation to the Interstate Commerce Commission by Examiner Thomas F. Sullivan; also this road should be allowed to acquire control by lease of the Gulf, Texas & Western, a line operating between Salesville Jct., Tex., and Seymour, 99.6 miles, and connecting with the Chicago, Rock Island & Gulf at Jacksboro, Tex., while the St. L. S. F. & T. should be permitted to operate by trackage rights over the C. R. I. & G. between Jacksboro and Ft. Worth, 71.6 miles. It is also recommended that the C. R. I. & G. be authorized to construct a line from Shamrock, Tex., southeasterly to a point on the St. L. S. F. & T., about five miles north of Quanah, Tex., and from Quanah southeasterly to a point on the proposed Vernon-Seymour line near Beaver creek, a total of 108 miles. The proposed report further recommends that the C. R. I. & G. be allowed to operate by trackage rights over the St. L. S. F. & T. between Quanah and a point five miles north thereof and over the proposed Vernon-Seymour line between Beaver creek and Seymour, 29 miles, and over the G. T. & W. between Seymour and Jacksboro, 76 miles. It is also recommended that the St. L. S. F. & T. be permitted to operate under trackage rights over the proposed Quanah-Beaver creek line of the C. R. I. & G., 35 miles, thereby providing a through and shorter route between northern Texas and southwestern Oklahoma and Ft. Worth.

New Lines in Texas

During the last month, Texas has led all other states in the number of miles of new lines for which authority has been granted by the Interstate Commerce Commission, or for which examiner's reports recommending their construction have been submitted to the commission. The Gulf & West Texas has been granted authority to build 69 miles and conditional authority to construct 44 more miles, while the construction of approximately 159 miles of line by three other roads has been recommended in reports to the commission. In addition, hearings have been held on 380 miles of new lines in southwestern states, approximately 150 miles of which are in Texas. The purpose of many miles of the new lines is to shorten the through routes of the respective roads to more distant points in the Southwest.

The Temiskaming & Northern Ontario, according to Premier G. Howard Ferguson of Ontario, will be extended by the Ontario government this year as far as Blacksmith Rapids and Moose Factory on James bay. The line from Coral Rapids, Ont., the present northerly terminus, to Blacksmith Rapids in the heart of the new lignite coal field—a distance of about 30 miles—will be started as soon as weather conditions permit and will be completed this summer. The road will then be pushed on toward James bay, with the hope that Moose Factory can be reached by the end of the year.

The Texas & Pacific plans to construct a new double-track bridge over Trinity river near Dallas, Tex., which will be about 2,000 ft. long and will have a steel truss span over the channel 200 ft. long. This road has awarded a contract to Robert E. McKee, El Paso, Tex., for the construction of a 23-stall roundhouse and other terminal facilities at Big Springs, Tex.

The Union Pacific contemplates the construction of a freight station, loading docks and additional sidings at Hays, Kan., to cost approximately $150,000.

The Virginian, according to Examiner Ralph R. Molster of the Interstate Commerce Commission in a proposed report to the commission, should be allowed to construct an extension of its line, approximately one mile long, from Deepwater, W. Va., to a connection with the Kanawha & Michigan by a bridge across the Kanawha river.

Supply Trade News

M. D. Tracy has been appointed general sales manager of the **Headley Emulsified Products Company,** with headquarters at Philadelphia, Pa.

A. C. Torbert has established an office at 75 E. Wacker drive, Chicago, to engage in the sale of railroad, industrial and contractors' equipment.

Sydney B. Grant has been appointed sales representative for the **Buda Company,** Harvey, Ill., with headquarters at 30 Church street, New York.

L. R. Payton, representative of the **Louisville Frog, Switch & Signal Company,** Louisville, Ky., with headquarters in the Railway Exchange building, St. Louis, Mo., has moved his office to Room 1101, Missouri Pacific building, 1218 Olive street.

W. Homer Hartz, vice-president and manager of sales of the Morden Frog & Crossing Works, Chicago, has been elected president to succeed **Irving T. Hartz,** whose death was reported in the January issue. W. Homer Hartz was born on December 11, 1887, at Tarrytown, N. Y., and graduated from Purdue University in 1907. He entered railroad service in the summer of 1904, in the engineering department of the Chicago Southern, (now a part of the Chicago, Milwaukee, St. Paul & Pacific), where he was engaged in location and construction work. In December, 1906, he was employed on track elevation work for the Pennsylvania and in 1907 entered the employ of the Baltimore & Ohio in the division engineer's office at Cumberland, Md. In the following year he went with the Oliver Iron Mining Company at Mountain Iron, Minn., where he remained until 1909, when he entered the employ of the C. M. St. P. & P. in the engineering department at Chicago. In 1911 he became associated with the Morden Frog & Crossing Works, as a draftsman and later was promoted to inspector and then to chief clerk and purchasing agent, which position he held until 1915, when he was promoted to secretary. In 1922, he was appointed treasurer and assistant manager of sales, and in December, 1927, vice-president and manager of sales, which position he held until his recent election.

W. Homer Hartz

George W. Bender has been appointed representative of the Louisville Frog, Switch & Signal Co., with headquarters at 819 Dayton avenue, St. Paul, Minn.

Alec S. Field, formerly with the Shell Petroleum Corporation, Dallas, Tex., in charge of the Eastern division, has resigned to go with the Nayler Pipe Company as assistant director of sales with headquarters at Chicago.

Fred Speer, for the past ten years with the Philadelphia office of the **Gustin Bacon Manufacturing Company** as mechanical representative, on January 1 became associated with the Joseph Dixon Crucible Company, Jersey City, N. J., as special railroad representative for its railroad products.

The Permanent Concrete Products Company, Greenville, Ohio, a subsidiary of the **American Aggregates Products Company,** has acquired the rights to manufacture and market "Interlock" reinforced concrete cribbing formerly manufactured by the **Gerald Company,** Chicago.

Trade Publications

Quikard Cement.—The Ash Grove Lime & Portland Cement Company, Kansas City, Mo., has issued a 16-page booklet showing the many kinds of work for which its quick-setting cement is adapted. Besides illustrations showing the various kinds of railway and street work for which this cement has been employed, the booklet also contains the reports of tests of this cement from different laboratories.

The Federal Cement Tile Company, Chicago, has issued a 36-page catalog describing and illustrating featherweight concrete insulating roof slabs, which are manufactured from concrete made up of Portland cement and Haydite, a form of burned shale. The catalog is divided into four principal sections: concrete slabs; detailed drawings of slabs; specifications and essential data covering the slabs; and detailed drawings of featherweight nailing concrete roof slabs.

Ball Bearings—The Gurney Ball Bearing division of the Marlin-Rockwell Corporation, Jamestown, N. Y., has issued a highly informative bound catalog of about 200 pages, which is a veritable text book on the subject of ball bearings and their application. The new catalog, which is called the Gurney Ball Bearing Manual, is a complete treatise on the subject of ball bearings, and, for the convenience of the user, it is of pocket size and all of the subjects discussed are indexed and cross-referenced.

Personal Mention

General

C. K. Scott, division engineer on the Erie, with headquarters at Youngstown, Ohio, has been appointed trainmaster on the Wyoming division, with headquarters at Dunmore, Pa.

Charles E. Adams, division engineer of the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., whose promotion to superintendent of the Grand Rapids division, with headquarters at Grand Rapids, Mich., was noted in the January issue, received his education at Ohio State University and entered the service of the Pennsylvania as a yard clerk in 1907. A year later he was transferred to the engineering department of the Richmond division and thence to the Cincinnati division in 1914, being in turn transferred to Akron, Ohio, where he worked for four years before becoming a supervisor in 1920. Three years later he was transferred to the Buffalo division and from there to the Eastern division in 1926. In 1928, he was promoted to division engineer of the St. Louis division and in less than a year he was transferred to West Philadelphia, where he remained until his recent promotion to superintendent.

Charles E. Adams

Joseph Henry Nuelle, vice-president and general manager and formerly chief engineer of the New York, Ontario & Western, with headquarters at Middletown, N. Y., whose election to president, with headquarters at New York, was noted in the January issue, was born on April 9, 1881, at Chicago. He was educated at Phillips Exeter Academy and Princeton University, and entered railroad service in 1907 as a rodman on the engineering corps of the Pennsylvania. A year later he entered the service of the New York, Ontario & Western as assistant engineer. From that position he was appointed engineer maintenance of way in 1912; chief engineer in 1913; assistant

general superintendent in 1915; general superintendent in 1916; federal manager in 1918; and general manager in 1920. In 1923 he was promoted to vice-president and general manager, which position he held until his recent election as president.

Hans Schantl, division engineer on the Missouri-Illinois, has been appointed superintendent with headquarters as before at Bonne Terre, Mo., to succeed **W. G. Patton,** resigned. The

Hans Schantl

position of division engineer has been abolished. Mr. Schantl was born on September 8, 1876, at Festus, Mo., and graduated from Washington University in 1903. He entered railway service on August 31, 1906, as an assistant engineer on the Mississippi River & Bonne Terre. Eight years later he was promoted to chief clerk to the general manager, being further promoted to purchasing agent and assistant engineer in March, 1916, which position he held until February, 1918, when he was appointed assistant engineer maintenance of way. Ten months later he was made engineer maintenance of way, holding this position until February 1, 1921, when he was appointed chief engineer of the Mississippi River & Bonne Terre, the Missouri-Illinois and the St. Francois County. On July 1, 1929, Mr. Schantl was appointed division engineer of the Missouri-Illinois after this road and the Mississippi River & Bonne Terre had been acquired by the Missouri Pacific. He was holding this position at the time of his promotion to superintendent, effective January 1.

C. C. Cunningham, whose promotion to trainmaster on the Chicago, Rock Island & Pacific, with headquarters at Herington, Kan., was noted in the January issue, was born on February 14, 1887, at Washington, Iowa. He graduated from Yale University in 1909 and entered railway service with the Rock Island in August of the same year as a chainman in the engineering department at Topeka, Kan. He served as a rodman and instrumentman at Topeka until January 1, 1913, when he was promoted to assistant engineer at Kansas City, Mo., being appointed transitman at Dalhart, Tex., in October of the same year. On April 26, 1916, Mr. Cunningham was promoted to roadmaster at Liberal, Kan., but returned to Dalhart as division engineer on March 1, 1917. He remained at Dalhart until May 1 of the same year, when he was transferred to Herington, serving there until August 27, 1917, when he joined the United States army. He returned to service with the Rock Island on August 19, 1919, as a corporate inspecting engineer of maintenance of way at Chicago, but returned to Herington on February 21, 1921, as division engineer, which position he was holding at the time of his promotion to trainmaster, effective October 15, 1929.

R. E. Dougherty, engineering assistant to the president of the New York Central, with duties covering the entire system and with headquarters at New York, has been promoted to vice-president, improvements and developments. Mr. Dougherty was born in New York on February 13, 1880, and graduated from Columbia University in 1901. He entered railway service with the New York Central on September 30, 1902, as a rodman, and was successively promoted to transitman and to inspector and assistant engineer on construction on the Middle district of what was then known as the New York Central & Hudson River. In December, 1904, he was appointed assistant engineer on grade crossing elimination, yard design, etc., with headquarters at New York, serving in this capacity until September, 1905, when he was promoted to resident engineer in charge of construction on

R. E. Dougherty

the Eastern district. In 1907, he was promoted to assistant district engineer, and to district engineer in 1910. In 1918, he was promoted to designing engineer, with jurisdiction over the lines east of Buffalo and with headquarters at New York. On October 1, 1924, he was appointed to special engineer to the vice-president with the same headquarters, and on October 1 of the following year, he was made engineering assistant to R. D. Starbuck, vice-president at New York. In November, 1926, he was promoted to engineering assistant to the president, which position he was holding at the time of his recent promotion.

J. S. Bassett, whose promotion to assistant superintendent of the Arkansas division of the Missouri Pacific, with headquarters at Little Rock, Ark., was noted in the December issue, was born at Sheldon, Iowa, in 1886. He was educated at Iowa State college, Ames, Iowa, and before entering rail-

J. S. Bassett

way service he spent several years on drainage and levee work in Illinois. In May, 1929, he entered railway service with the Missouri Pacific in the engineering department and has been with that company continuously, with the exception of the years from 1917 to 1919, which he spent in the United States army where he was commissioned a first lieutenant. On returning from the war, Mr. Bassett was made assistant engineer on the Joplin division at Nevada, Mo., and two years later he was transferred to the district engineer's office at St. Louis. In February, 1923, he was promoted to division engineer of the Northern Kansas division with headquarters at Atchison, Kan., and a year later he was transferred to the Colorado division at Herington, Kan., being further transferred to McGehee, Ark., in December, 1924. On February 16, 1929, Mr. Bassett was transferred to Little Rock, Ark., where he was located at the time of his promotion to assistant superintendent, effective November 20.

Engineering

B. P. Habersham, resident engineer on the Spokane, Portland & Seattle, has retired from active service after 34 years of service with that road.

John F. Spain has been appointed supervising cost engineer, reporting to the engineer maintenance of way of the Boston & Maine, with headquarters at Boston, Mass.

F. M. Rutter, superintendent on the Quebec district of the Canadian Pacific, with headquarters at Smith's Falls, Ont., has been appointed assistant district engineer of the British Columbia

district, with headquarters at Vancouver, B. C.

William A. Johnson, an instrumentman in the maintenance of way department of the Chesapeake & Ohio, has been appointed assistant cost engineer with headquarters at St. Albans, W. Va.

H. S. Jones, valuation engineer of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., effective December 30, was appointed to a similar position on the New Orleans Great Northern.

J. G. Wishart, office engineer of the Chicago, Rock Island & Pacific, with headquarters at Chicago, has been promoted to principal assistant engineer with the same headquarters, a newly created position, effective January 1.

F. H. Masters, assistant chief engineer of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., has been appointed acting chief engineer to take the place of **A. Montzheimer,** who has been granted a leave of absence.

C. J. Frederici, assistant engineer on the Chicago & North Western, with headquarters at Winner, S. D., has been promoted to division engineer, with headquarters at South Pekin, Ill., succeeding **L. M. Bates,** whose death was noted in the January issue.

William Shea, general roadmaster of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, has been appointed assistant engineer of maintenance of way, with the same headquarters, and the title of general roadmaster has been abolished.

W. W. Salisbury, roadmaster in charge of the Kansas City terminals of the Missouri Pacific, with headquarters at Kansas City, Mo., has been promoted to assistant division engineer of the Kansas City Terminal division, with headquarters at the same place.

J. B. Lindsey, principal assistant engineer on the Atlantic Coast Line, with headquarters at Wilmington, N. C., has resigned to become identified with the banking business of Wilmington. The duties of Mr. Lindsey have been assumed by **D. B. Packard,** engineer of construction.

G. Cottingham, W. C. Groth, F. J. Hoffman and **F. U. Mayhew,** engineers maintenance of way of the Chicago Great Western, with headquarters at Chicago, St. Paul, Minn., Clarion, Iowa, and Des Moines, respectively, have had their titles changed to division engineer.

W. H. Miesse, resident engineer on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Cincinnati, Ohio, has been appointed engineer maintenance of way of the Evansville, Indianapolis & Terre Haute, with headquarters at Washington, Ind. **Fred Myers,** assistant division engineer on the Michigan division, with headquarters at Wabash, Ind., succeeds Mr. Miesse at Cincinnati.

R. H. Crew, assistant division engineer on the Philadelphia Terminal division of the Pennsylvania, has been promoted to division engineer of the Akron division, with headquarters at Akron, Ohio, to succeed **W. H. Anderson,** whose transfer to Camden, N. J., was noted in the January issue.

F. X. Fischer, instrumentman in the engineering department of the Chicago, Burlington & Quincy, with headquarters at Aurora, Ill., has been promoted to division engineer, with headquarters at Galesburg, Ill., to succeed **A. E. Smith,** whose death is noted elsewhere in these columns

C. J. Code, supervisor on the Pennsylvania, with headquarters at Tyrone, Pa., has been promoted to division engineer assigned to the office of chief engineer, with headquarters at Philadelphia, Pa. **E. R. Parke,** division engineer, office of supervisor of motor bus service with headquarters at Philadelphia, has been appointed division engineer assigned to the office of chief engineer, with the same headquarters.

Vincent H. Doyle, office engineer in the valuation department of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been appointed valuation engineer of the Pere Marquette with headquarters at Detroit, Mich. **Victor H. Krueger** has been promoted to office engineer in the valuation department at Richmond to succeed Mr. Doyle. Mr. Doyle entered the service of the Hocking Valley in 1908, as a rodman in the engineering department and served in various

Vincent H. Doyle

capacities, being appointed assistant division engineer in 1914. However, he left railway service in the same year to become associated with the Public Utilities Commission of Ohio as appraisal engineer, returning to the Hocking Valley in 1917, as assistant engineer and chief land appraiser in the valuation department. He left the service for a time during the World War, when he served as a first lieutenant in the field artillery, but returned to the Hocking Valley after the war. In 1927, he was appointed terminal land appraiser of the Chesapeake & Ohio and later office engineer in the valuation department, which position he was holding at the time of his recent promotion to valuation engineer of the Pere Marquette.

Charles D. Purdon, consulting and valuation engineer of the St. Louis-Southwestern, with headquarters at St. Louis, Mo., retired from active service

Charles D. Purdon

on January 1, after 56 years of railway service. He was born in Ireland, on October 6, 1850, and entered railway service in 1870, as an axman on the Intercolonial (now part of the Canadian National). Mr. Purdon was in charge of the location and construction of many miles of road in the United States, and supervised the construction of several large bridges. He also held important positions in the engineering department of several roads, having been assistant chief engineer in charge of branch line construction of the Louisville & Nashville; assistant chief engineer of the Atchison, Topeka & Santa Fe; chief engineer of the Kansas City Belt (now part of the Kansas City Terminal); chief engineer of the Frisco; chief engineer of the Memphis Terminal (now part of the Illinois Central), and assistant engineer on the Missouri Pacific on valuation of the Nebraska lines and grade separation at St. Louis. In 1910, Mr. Purdon was appointed chief engineer of the Cotton Belt, being made consulting and valuation engineer in 1918.

G. B. Alexander, roadmaster on the Lethbridge division of the Alberta district of the Canadian Pacific, with headquarters at Lethbridge, Alta., has been promoted to division engineer of the Revelstoke division of the British Columbia district, with headquarters at Revelstoke, B. C., to succeed **J. H. Soans,** whose appointment as roadmaster is noted elsewhere in these columns. **K. A. Dunphy,** division engineer on the Brandon division of the Manitoba district, with headquarters at Brandon, Man., has been transferred to the Kenora division of the same district, with headquarters at Ft. William, Ont., to succeed **D. C. Chisholm,** who

has been transferred to Kenora, Ont., to succeed **S. C. Wilcox,** who has been in turn transferred to Brandon to succeed Mr. Dunphy.

E. L. Potarf, division engineer on the Sterling division of the Chicago, Burlington & Quincy, with headquarters at Alliance, Neb., has been promoted to engineer maintenance of way, with the same headquarters, succeeding **E. H. Piper,** who has been transferred to Lincoln, Neb.

Spencer Danby, assistant division engineer of the Maryland division of the Pennsylvania, with headquarters at Wilmington, Del., has been promoted to division engineer of the Cumberland Valley division, with headquarters at Chambersburg, Pa., to succeed **W. W. Patchell,** who has been transferred to the Ft. Wayne division, with headquarters at Ft. Wayne, Ind., to succeed **J. L. Gressitt,** whose promotion to superintendent of the Sunbury division, with headquarters at Sunbury, Pa., was noted in the January issue.

J. R. Van Lenten, chief of corps in the engineering department of the Erie at Jersey City, N. J., has been promoted to assistant division engineer of the New York Terminal division, with headquarters at Jersey City, succeeding **A. E. Kriesen,** who has been transferred to the New York division, with the same headquarters. Mr. Kriesen succeeds **F. C. Kronauer,** who has been promoted to division engineer of the New York Terminal division, with headquarters at Jersey City, succeeding **P. Sabbot,** who has been transferred to Youngstown, Ohio. Mr. Sabbot succeeds **C. K. Scott,** who has been promoted to trainmaster, with headquarters at Dunmore, Pa., as noted elsewhere in these columns.

E. J. Bayer, engineer maintenance of way of the Peoria & Eastern, with headquarters at Indianapolis, Ind., has been appointed division engineer of the Indianapolis terminal and the Springfield division of the Cleveland, Cincinnati, Chicago & St. Louis, with the same headquarters, succeeding **J. W. Burt,** who retired on January 1. Mr. Bayer was born on April 1, 1888, at Cincinnati, Ohio, and after attending the public schools of Sidney, Ohio, he entered Purdue University, graduating with a degree in civil engineering in 1910. He immediately entered the service of the Big Four as an assistant on the engineer corps of the Cairo division, serving in this capacity on various divisions until September 1, 1914, when he was promoted to assistant engineer maintenance of way of the Cleveland division. From June 24, 1918, until August 1, 1919, he was acting engineer maintenance of way of the Cairo division, returning to the Cleveland division on the latter date as assistant engineer maintenance of way, where he remained until August 1, 1921, when he was promoted to engineer maintenance of way of the Evansville, Indianapolis & Terre Haute. On May 1, 1924, Mr. Bayer was appointed engineer maintenance of way of the Peoria & Eastern, which position he was holding at the time of his promotion to division engineer, effective January 1.

H. S. Ashley, acting assistant division engineer on the Fitchburg division of the Boston & Maine, with headquarters at Fitchburg, Mass., has been appointed assistant division engineer with the same headquarters. At the time of his promotion to acting assistant division engineer, Mr. Ashley was track supervisor on the Portland division, with headquarters at Rochester, N. H., instead of assistant engineer at Dover, N. H., as erroneously stated in the December, 1929, issue. **H. C. Archibald,** whose appointment to acting division engineer of the Connecticut River division, with headquarters at Springfield, Mass., was noted in the December issue, has been appointed division engineer, with the same headquarters. **F. E. Sampson,** division engineer of the Connecticut River division at Springfield, who has been on leave of absence, has been appointed assistant engineer reporting to the engineer maintenance of way, with headquarters at Boston, Mass.

H. R. Davis, whose promotion to division engineer on the Illinois Central, with headquarters at Greenville, Miss., was noted in the January issue, was born on November 15, 1882, at Dyersville, Iowa. He was educated at Cornell College and the State University of Iowa, graduating from the latter in 1906, with a degree in civil engineering. He entered railway service almost immediately with the Illinois Central as a chainman in the construction department and in December, 1907, he was promoted to rodman, serving in this capacity, and as a chainman at many points on the southern lines of the I. C., until February, 1910, when he was transferred to the maintenance of way department at Corinth, Miss., as a rodman. In December, 1910, Mr. Davis was promoted to instrumentman on the New Orleans division of the Yazoo & Mississippi Valley (part of the Illinois Central) at Vicksburg, Miss., and in November, 1913, he was further promoted to resident engineer at Baton Rouge, La., in which position he served until September, 1914, when he returned to Vicksburg as an assistant engineer. He held this position for the next 11 years, being on October 1, 1925, promoted to track supervisor at Harriston, Miss., which position he was holding at the time of his promotion to division engineer, effective December 1.

Fred P. Funda, office engineer in the maintenance of way department of the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., has been promoted to division engineer of the Arkansas-Louisiana division, with headquarters at Little Rock, Ark., to succeed **H. T. Livingston,** who has been promoted to engineer of construction with headquarters at Chicago. Mr. Livingston graduated from the University of Missouri with a degree in civil engineering and entered railroad service in 1909, in the engineering department of the C. R. I. & P. In 1915, after occupying various minor positions, he was promoted to assistant engineer on the Iowa division at Cedar Rapids, Iowa, then being transferred to Manly, Iowa, and later back to Cedar Rapids. Mr. Livingston was appointed master carpenter at Cedar Rapids in 1916, where he remained until 1917, when he enlisted in the United States Army. During the World War, he served in France as captain of Company E, 313th Engineers, 88th division. In 1919, upon returning to the United States, he was appointed division engineer of the Minnesota division of the Rock Island at Manly. In 1921 he was transferred to the Des Moines Valley division at Des Moines, Iowa, where he remained until March, 1923, when he was transferred to the Arkansas division at Little Rock, Ark.

John Edwards, Jr., whose promotion to division engineer of the Monongahela division of the Baltimore & Ohio, with headquarters at Grafton, W. Va., was noted in the November issue, was born on December 4, 1890, at Mason, W. Va., and graduated in civil engineering from the Catholic University of America, Washington, D. C. On July 30, 1912, shortly after leaving school, he entered railway service with the B. & O. as a rodman on the Pittsburgh district, but left the service in November, 1913, to serve with the United States Forest Service as a transitman. He later engaged in highway work at Washington, D. C., and served with the Interstate Commerce Commission as a junior engineer, returning to the Baltimore & Ohio as a transitman at Baltimore, Md., in May, 1916. He was promoted successively to assistant track supervisor at Meyersdale, Pa., and to assistant division engineer at Philadelphia, Pa., again leaving the service in July, 1917, to enter the United States army, where he served with the 32nd Engineers as a second lieutenant and captain. He returned to service with the B. & O. in 1919, as assistant division engineer at Keyser, W. Va., and was promoted to assistant engineer maintenance of way and structures at Pittsburgh in 1925, which position he was holding at the time of his recent promotion to division engineer.

Track

E. B. Reddy, roadmaster on the Missouri-Kansas-Texas, with headquarters at Sedalia, Mo., has moved his headquarters to Harrisonville, Mo.

W. W. Weddle, assistant roadmaster on the Terre Haute, Indianapolis & Eastern, has been promoted to road-

master with headquarters at Indianapolis, Ind., succeeding **John O'Laughlin,** whose death is noted elsewhere in these columns.

James W. Donelson, assistant supervisor of track on the New York Central, with headquarters at Buffalo, N. Y., has retired from active service.

Paul M. Guyer, general foreman on the new line of the Chicago, Rock Island & Pacific between Liberal, Kan., and Amarillo, Tex., has been promoted to assistant roadmaster with headquarters at Gruver, Tex.

J. A. Nolan, roadmaster on the Missouri-Illinois division of the Missouri Pacific, with headquarters at Gale, Ill., has been granted a six-months' leave of absence because of ill health.

Thomas Keller, road supervisor on the Louisville & Nashville, with headquarters at Paris, Ky., has retired from active service after more than 47 years with that road.

J. F. Campbell, roadmaster on the Missouri Pacific, with headquarters at Hope, Ark., has been transferred to Pine Bluff, Ark., to succeed **J. T. Conley,** who has in turn been transferred to Hope.

Jack Stewart has been appointed acting roadmaster on the Shasta division of the Southern Pacific, with headquarters at Alturas, Cal., to replace **T. L. Williamson,** who has been granted a leave of absence.

Melvin L. Doyle has been appointed acting supervisor of track on the Akron division of the Baltimore & Ohio, with headquarters at Warren, Ohio, to replace **Fred Green,** who is on leave of absence because of illness.

M. W. Parse, an engineer on construction for the Missouri Pacific, has been appointed roadmaster in charge of the Kansas City terminals with headquarters at Kansas City, Mo., to succeed **W. W. Salisbury,** whose promotion to assistant division engineer has been noted elsewhere in these columns.

J. C. Reid, a member of the engineering department of the Gulf, Colorado & Santa Fe, with headquarters at Beaumont, Tex., has been appointed acting roadmaster with headquarters at Conroe, Tex., to replace **M. M. Killen,** who has been transferred temporarily to Temple, Tex., to replace **M. Clarke,** on leave of absence.

D. J. McCarthy, track supervisor on construction on the Boston & Maine, has been appointed track supervisor in the maintenance department, with headquarters at Ayer, Mass. **Joseph Paluch** has been appointed assistant track supervisor at Brattleboro, Vt.

Harold Anderson, section foreman on the Canadian Pacific, with headquarters at Mission, B. C., has been promoted to roadmaster, with headquarters at Bull River, B. C., to succeed **H. Mikkelson,** who has been transferred to Grand Forks, B. C., to succeed **P. Gustafson,** who has been transferred to North Bend, B. C., where he replaces **J. H. Baker,** who has been, in turn, transferred to Kamloops, B. C., replacing **O. Larson,** retired.

R. B. Tyer, ballast gang foreman on the Atlantic Coast Line, has been promoted to roadmaster with headquarters at Kissimmee, Fla., to succeed **F. C. Chandler,** who has been promoted to acting general roadmaster on the Northern district of the First division, with headquarters at Rocky Mount, N. C., to replace **T. J. Joyner,** on sick leave. **C. Fowler,** roadmaster with headquarters at Rocky Mount, has been transferred to Sebring, Fla., to succeed **J. H. Kansinger,** who has been transferred to Rocky Mount.

Herbert Gunning, track foreman on the Canadian Pacific, with headquarters at Chalk River, Ont., has been promoted to roadmaster on the Smith's Falls division of the Quebec district, with headquarters at Smith's Falls, Ont., to succeed **T. J. Armstrong,** who has retired. **J. H. Soans,** division engineer on the Revelstoke division of the British Columbia district, with headquarters at Revelstoke, B. C., has been appointed roadmaster on the Lethbridge division of the Alberta district, with headquarters at Lethbridge, Alta., to succeed **G. B. Alexander,** whose promotion to division engineer is noted elsewhere in these columns.

C. W. Feld of the chief engineer's office of the Reading, with headquarters at Philadelphia, Pa., has been promoted to assistant supervisor in the division engineer's office, with headquarters at Camden, N. J., succeeding **H. F. Smith,** who has been transferred to Pottstown, Pa., to succeed **R. W. G. Morrison,** who has been promoted to supervisor on the Manayunk track elevation work, with headquarters at Manayunk, Pa., to succeed **C. F. Forstall,** who has been transferred to Port Richmond, Pa., to replace **P. R. Bickford,** who, in turn, has been transferred to Pottstown, to succeed **C. J. Lepperd,** resigned.

J. F. Mayne, whose promotion to roadmaster on the White River division of the Missouri Pacific, with headquarters at Batesville, Ark., was noted in the January issue, was born on July 19, 1897, at Fitchburg, Mass., and graduated from the University of Illinois in 1923. From June, 1917, until August, 1919, and prior to entering college, Mr. Mayne served with the M. P. as a rodman at Little Rock, Ark., where he was also rodman from July until September, 1922, during the summer vacation from school. On March, 7, 1923, after leaving school, Mr. Mayne returned to Little Rock as a rodman and was promoted to instrumentman in May of the same year. Fifteen days later, he was transferred to Monroe, La., returning to Little Rock in the same capacity on February 1, 1924. He was transferred to Wynne, Ark., in June, 1925, where he was appointed field engineer in February, 1926, returning to the position of instrumentman in October of that year. He was holding this latter position at the time of his recent promotion to roadmaster.

Changes on the Pennsylvania

J. L. Cranwell has been appointed supervisor of track on the Pennsylvania, with headquarters at Bordentown, N. J., succeeding **F. T. Fish,** who has been transferred to Woodside, Queens County, N. Y., to succeed **Lee Spencer,** who has been appointed supervisor in charge of the Jamaica east improvement at Jamaica, N. Y. **C. R. Gerard,** supervisor at Jamaica, has been transferred to Mt. Holly, N. J., to replace **S. A. Hart,** who in turn has been transferred to Jamaica. **G. W. Pettinger,** assistant supervisor at Jamesburg, N. J., has been transferred to Bordentown to replace **J. D. Witmer,** who has been transferred to Jersey City, N. J. **John Bell,** assistant on the engineering corps, with headquarters at Trenton, N. J., has been promoted to assistant supervisor, with headquarters at Jamesburg, to succeed Mr. Pettinger. **J. S. Snyder,** assistant supervisor with headquarters at New Brunswick, N. J., has been appointed acting supervisor at Phillipsburg, N. J., to replace **H. J. Devall,** on leave of absence. **J. D. Mead,** assistant on the engineering corps at Jamaica, has been appointed acting assistant supervisor with headquarters at Patchogue, N. Y., to replace **H. S. Unangst,** who has been appointed acting assistant supervisor at Jamaica to take the place of **M. O. Woodrow,** on leave of absence.

R. Dejaisse, assistant on the engineering corps with headquarters at Downington, Pa., has been promoted to assistant supervisor at Norristown, Pa., to succeed **C. I. Uitts,** who has been transferred to Lancaster, Pa., succeeding **G. M. Haines** who has been promoted to supervisor, with headquarters at Norristown, where he succeed **P. E. Feucht,** who has been transferred to Tyrone, Pa., to replace **C. J. Code,** whose promotion to division engineer is noted elsewhere in these columns. **W. H. Heins,** assistant supervisor with headquarters at Tyrone has been transferred to Chambersburg, Pa., to succeed **J. B. Jones,** who in turn has been transferred to Tyrone.

E. R. Shultz, assistant supervisor on the Eastern division, with headquarters at Alliance, Ohio, has been promoted to supervisor on the Cleveland division, with headquarters at Ravenna, Ohio, to succeed **W. W. Boyer,** who has been transferred to the Pittsburgh division, with headquarters at Johnstown, Pa., to replace **C. P. Willis,** who has been transferred to the Renova division, with headquarters at Erie, Pa., to replace **C. K. Kuszwaul,** who has resigned.

R. W. Speidel, assistant on engineer corps, with headquarters at Huntingdon, Pa., has been promoted to assistant supervisor, with headquarters at Hollidaysburg, Pa., to succeed **C. B. McFarland,** who has been transferred in the same capacity to Middletown, Pa., where he, in turn, will succeed **H. Hill,** who has been promoted to supervisor at Cresson, Pa. **M. J. Miller,** acting supervisor at Barnesboro, Pa., has been appointed supervisor with the same headquarters.

C. R. McNary, a floating gang foreman on the St. Louis division, has been promoted to supervisor on the Cincinnati division, with headquarters at Anderson, Ind., to succeed **R. Y. Yates,** who has been transferred to the St. Louis division, with headquarters at Terre Haute, Ind., to replace **S. E. Oglesby,** who in turn succeeds **Homer Pryor** as supervisor on the Indianapolis division, with headquarters at Spencer, Ind. Mr. Pryor has been transferred to Richmond, Ind., to succeed **W. L. Ballinger** who has retired. **G. W. Hunter,** has been promoted to assistant supervisor, with headquarters at Valparaiso, Ind., to succeed **C. D. Merrill,** who has been transferred.

Bridge and Building

J. E. Rawlinson, supervisor of bridges and buildings on the Louisville & Nashville, with headquarters at Louisville, Ky., has had his territory extended to include the Louisville, Henderson & St. Louis, and the Owensboro and Nashville division, these territories now being operated as one division under the name of the Owensboro division.

Water Service

L. B. Logsdon, carpenter foreman on the Louisville division of the Louisville & Nashville, has been promoted to supervisor of water stations of the same division, with headquarters at Louisville, Ky.

R. M. Stimmel, chemist of the Hocking Valley, with headquarters at Columbus, Ohio, has been appointed chief chemist of the Chesapeake & Ohio, with headquarters at Huntington, W. Va., to succeed **S. C. Johnson,** who has resigned. **O. E. Mace,** a chemist on the Missouri Pacific, with headquarters at Kansas City, Kan., succeeds Mr. Stimmel at Columbus. **C. H. Price,** laboratory assistant on the Chesapeake & Ohio, with headquarters at Huntington, W. Va., has been promoted to assistant chemist with headquarters at Peru, Ind., to succeed **R. J. Hill,** who has resigned.

Purchases and Stores

Charles H. Painter, assistant to the vice-president of the New York, New Haven & Hartford, has been appointed purchasing agent with headquarters at New Haven, Conn.

H. E. Warren, manager of purchases and stores of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., effective December 30, was appointed to a similar position on the New Orleans Great Northern.

C. R. Hosking, storeroom accountant on the Missouri-Illinois at Bonne Terre, Mo., has been promoted to division storekeeper, with headquarters at the same point, succeeding **W. H. Butler,** who has resigned.

William C. Bower, manager of purchases and stores of the New York Central, with headquarters at New York, has been promoted to vice-president in charge of purchases and stores with the same headquarters.

J. L. Cowan, assistant purchasing agent of the Southern Pacific, Texas and Louisiana Lines, with headquarters at Houston, Tex., has been promoted to purchasing agent with headquarters at New Orleans, La., to succeed **N. P. Randolph,** who retired on December 31.

J. S. Pitchford, assistant inspector of stores of the Seaboard Air Line, with headquarters at Portsmouth, Va., has been appointed assistant storekeeper, Portsmouth general store, with the same headquarters. **L. H. Haynes,** storekeeper at Savannah, Ga., succeeds Mr. Pitchford at Portsmouth. **H. F. Perritt,** assistant storekeeper, with headquarters at Portsmouth, has been appointed storekeeper at Savannah, succeeding Mr. Haynes.

Obituary

Frank Springstein, retired assistant roadmaster on the Pennsylvania division of the Delaware & Hudson with headquarters at Thompson, Pa., died on December 10, at Windsor, N. Y.

A. E. Smith, division engineer on the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., died on January 6.

R. E. Patterson, a retired roadmaster on the Missouri-Kansas-Texas, died at his home at Mokane, Mo., on November 24, after a lingering illness.

N. S. Hunt, assistant to the purchasing agent of the Delaware & Hudson, with headquarters at Albany, N. Y., died at his home in that city on December 19.

John O'Laughlin, roadmaster on the Terre Haute, Indianapolis and Eastern, with headquarters at Indianapolis, Ind., died at his home in that city on January 2.

William A. Madden, retired division engineer on the Pere Marquette, died on December 24, at his home in Grand Rapids, Mich. He was 63 years of age and had been in the service of the Pere Marquette for 47 years.

B. B. Kelliher, a former railway engineer in Ireland, Canada and the United States, died at London, England, on November 7, at the age of 67 years. Mr. Kelliher had served with many railways in the United States and Canada, having been division engineer on the Oregon Short Line, resident engineer in charge of location of the Denver, Northwestern & Pacific (now the Denver & Salt Lake), and division engineer and chief engineer of the Grand Trunk Pacific. He also had been connected with the engineering departments of the Union Pacific and the Northern Pacific and had served as assistant to the president of the Denver & Rio Grande Western. Since his retirement in 1923, Mr. Kelliher has resided in Ireland.

A. L. Czamanske, assistant chief carpenter on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis., died at his home in that city on January 22. He was a chief carpenter on the Milwaukee for many years but ill health required him to accept a position of less exacting responsibilities about a year ago.

Major Benjamin S. Wathen, who retired as chief engineer of the Texas & Pacific in 1912, died at Dallas, Tex., on December 30, at the age of 84 years. Major Wathen had been connected with the location and construction of many roads in the United States and was appointed chief engineer of the Texas & Pacific in 1892.

Edward F. Ball, engineering assistant in the office of the general attorney of the New York Central, with headquarters at New York, died on November 4 last, at the age of 63 years. Mr. Ball was educated at Toronto University and the Toronto School of Practical Science and had a broad experience in the engineering field before entering railway service with the New York Central in 1900.

E. W. Brown, division roadmaster on the Illinois Central with headquarters at Baton Rouge, La., whose death was noted in the January issue, was born on August 31, 1872, in McNair county, Tenn., and entered the service of the Illinois Central as a trackman in 1890 at Brownfield, Miss. Within the same year he was promoted to assistant track foreman, but resigned eight months later to engage in other work. He re-entered the service of this road in May, 1891, as an assistant track foreman and was promoted to track foreman a year later. He again resigned in May, 1897, but re-entered the service as a track foreman in July of the same year, with headquarters at Middleburg, Tenn., being promoted to general foreman at Milan, Tenn., in September, 1900. Six months later he was promoted to supervisor of track at Durant, Miss., and in September, 1904, he was appointed roadmaster (now division engineer) with headquarters at Water Valley, Miss. Eight years later he was transferred to the New Orleans division with headquarters at Vicksburg, Miss. Early in 1926, Mr. Brown was transfered to Baton Rouge, coincident with the removal of the division headquarters to that point. He remained at Baton Rouge until his death on November 21, 1929.

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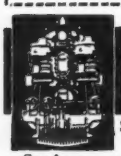

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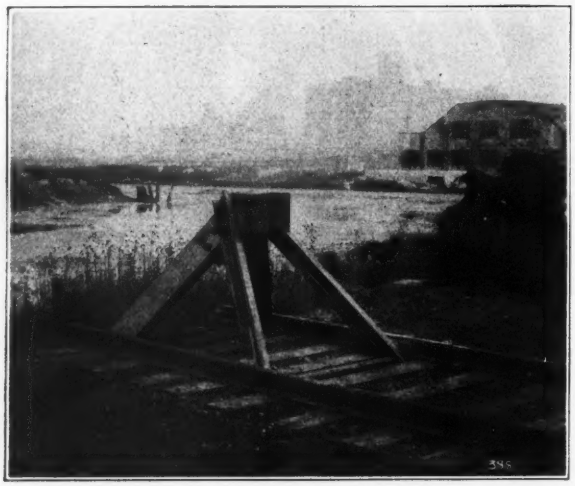

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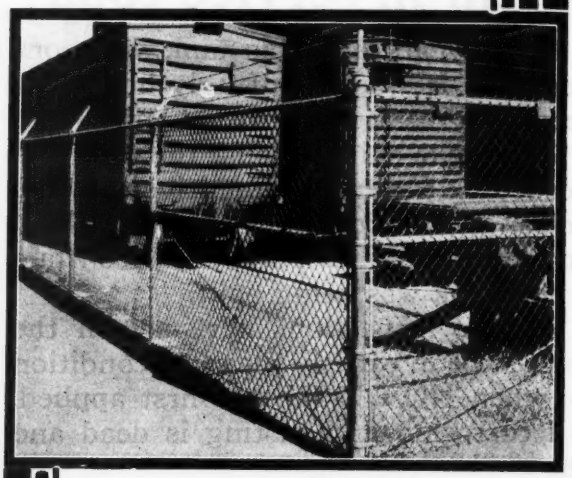

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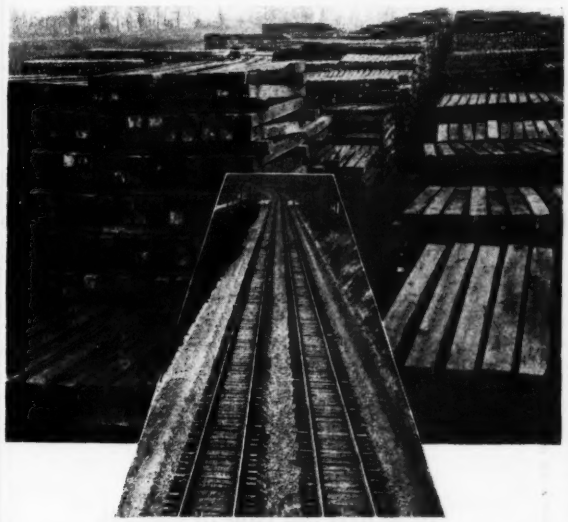

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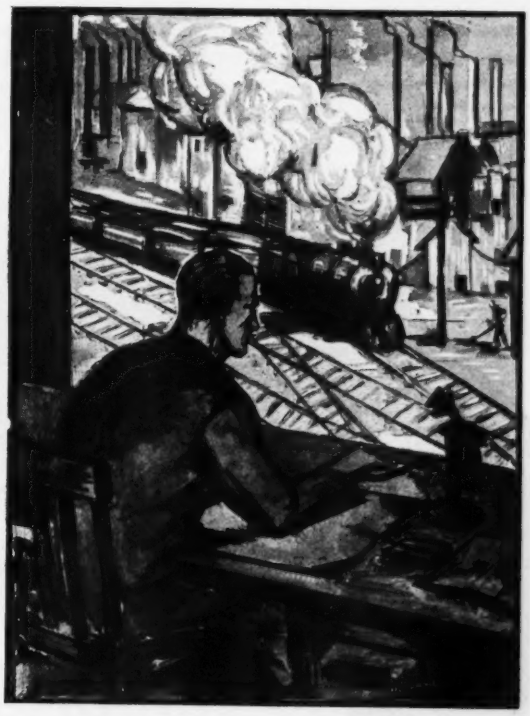

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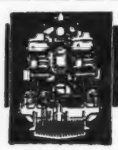

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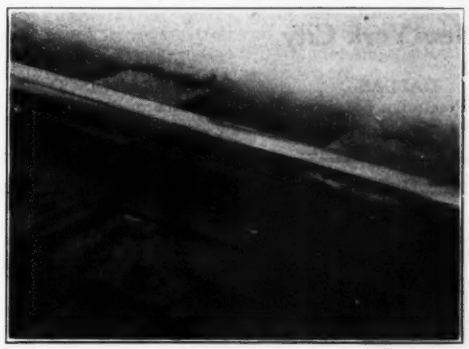

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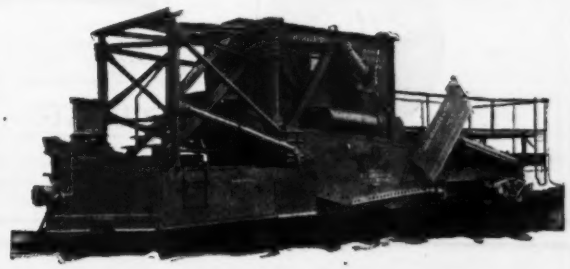

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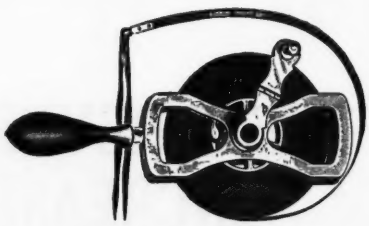

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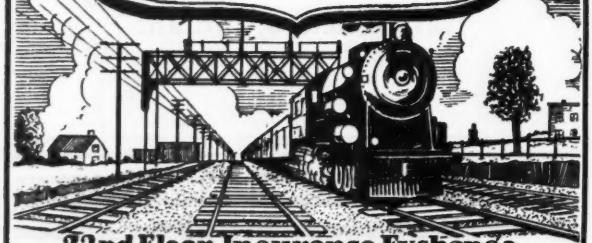

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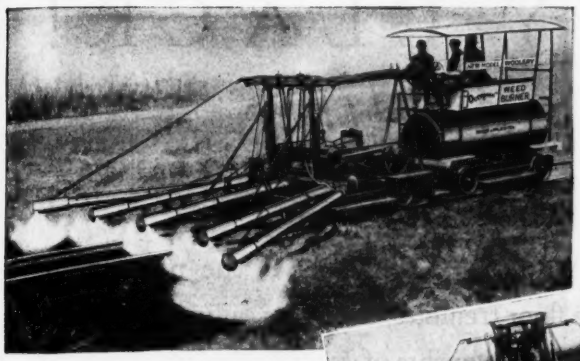

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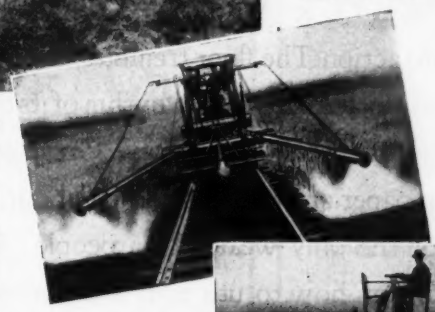

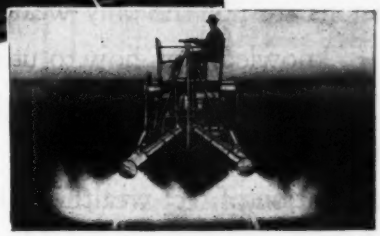

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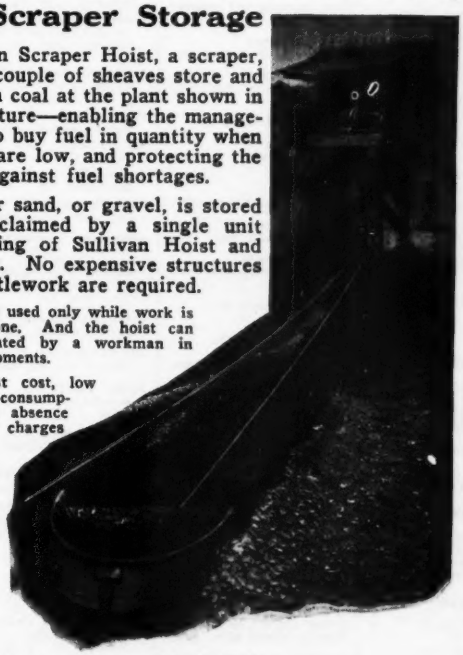

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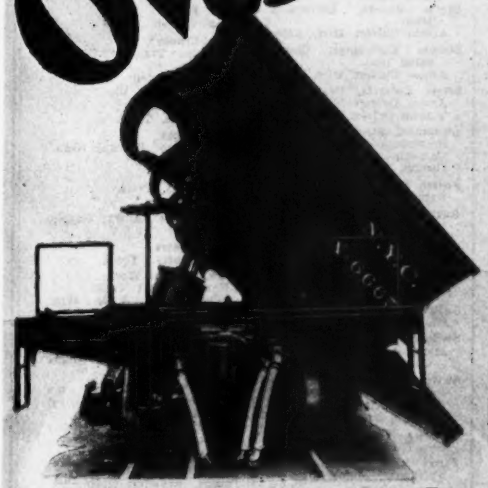
Over 50° Angle in full Dump position



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Massey Concrete Products Corp.

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Pipe, Sewer
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Plumbing Fixtures, Vitreous China
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Posts, Fence
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Screw Spike Drivers
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Switchpoint, Reconditioning
Morrison Railway Supply Corp.

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Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

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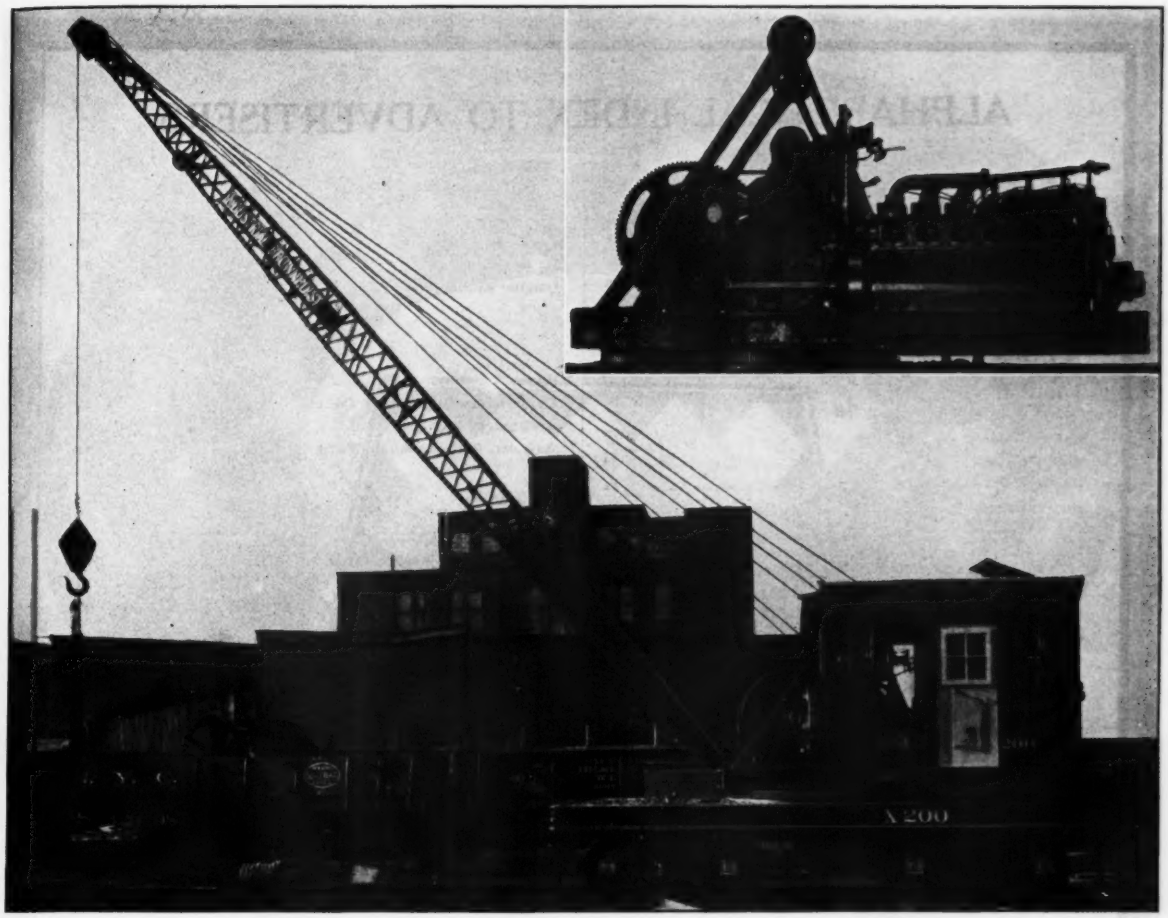
Wood Working Machinery
American Saw Mill Machinery Co.



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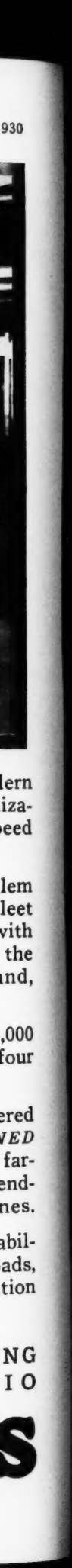
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